31st Congress,
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[SENATE.]

13

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LETTER

FROM

THE SECRETARY OF THE TREASURY,

COMMUNICATING

The report of the Superintendent of the Coast Survey, showing the progress of that work during the year ending November, 1849.

December 27, 1849.

ead and ordered to be printed, and that 5,500 additional copies be printed, 500 of which are for the Superintendent of the Coast Survey.

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etter from the Secretary of the Treasury, communicating the report of the Superintendent of the Coast Survey, showing the progress of that work.

Treasury Department,
December 27, 1849.

Sir: I have the honor to submit, for the information of the Senate, ie accompanying report, made to the department by Professor A. D. ache, superintendent of the coast survey, showing the progress of said ork during the year ending November, 1849. All of which is respectfully ibmitted.

W. M. MEREDITH,
Secretary of the Treasury.

Hon. Millard Fillmore,
Vice President of the United States,
and President of the Senate.

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eport of the Superintendent of the Coast Survey, showing the progress of the work for the year ending November, 1849.

Mount Independence,
Near Portland, Maine, October, 1849.

Sir: In compliance with the regulations of the Treasury Department r the coast survey, I have the honor to submit to you my report of the ogress of the work during the past year, to be laid before the President id Congress.

The reports of the assistants enable me to state the progress of the sury up to the month of October, and in some cases to November. The itire season's work of the parties in North Carolina, and the sections south of it, is thus included; while in part of the eastern sections, and as far south as Maryland and Virginia, the parties are still in the field. Some part of the operations of the survey, including field and office work, has been carried on in every State on the Atlantic coast and Gulf of Mexico; and a beginning has been made on the western coast. The period embraced in the report is in part included in the past, and in part in the presen fiscal year.

The report contains:—1. A general statement of the progress of the coast survey, and of the publication of its results. 2. A separate summary of the progress during the past year. 3. The work proposed for the next *fiscal year*, with the estimated cost. 4. A more detailed account of the several operations in each section of the survey, under the different officers, with a notice of the results obtained. 5. An account of the office work for the year. 6. An appendix, containing tables of occupation o parties and results, and reports from the assistants on matters of interest t navigation, lists of maps published, and the like. The sketches appende to it are of two different classes: the first, illustrating the progress of th several operations in each section of the coast; and the second, preliminary charts or sketches of important localities examined within the pas year. A table indicates briefly the contents of each separate paper in th appendix, and of each sketch. The sketches illustrating the progress o the work are as follows: in section 1, sketch A; section 2, sketch B; section 3, sketch C, and C No. 2; section 4, sketch D; section 5, sketch E and E *bis;* section 6, sketch F; section 7, sketch G; section 8, sketch H section 9, sketch I. The preliminary charts are: B No. 2, Buttermil channel, New York harbor; D No. 3, Hatteras cove; D No. 4, Hattera inlet; E No. 2, Bull's bay, near Charleston. There are, besides, two shee of diagrams, H *bis* and *tris*.

The operations of the survey are now generally understood, but it is n so generally known that the scientific parts of the work, which give it great value—its essential value—are not the expensive parts, but that tho most eminently practical are the most costly ones. In realizing t idea of Jefferson and Gallatin of a geodetic survey of the coast of the U ted States, the difference of cost between it and a series of combined na tical and topographical surveys, conducted on equally economical principl is unimportant, while the difference of value is very considerable.

The capacity of the geodetic method of survey for rapid progress is ve great wherever the country is at all favorable to it. I have visited parts the coast of fifteen of the nineteen States on the Atlantic and Gulf of Mexi and have a more or less minute acquaintance with the character of most the other parts of the coast, through the operations of the survey and t reports of the assistants. In nearly the whole extent the facilities for application of the geodetic method are remarkable. On the coast of Mai New Hampshire, Massachusetts, Rhode Island, Connecticut, New Yo and a part of New Jersey, are lofty hills, rising in some cases to mountai just such as invite triangulation. On the coast of Connecticut, N York, part of New Jersey, North Carolina, Florida, and Mississippi, th are wide sounds between the main shore and the ocean beaches, wh are particularly favorable for the work. Off the coast of Massachuse Florida, Mississippi, and Louisiana, there are numerous islands at distan from the main which exactly adapt them to a continuous chain of tr gles connecting them with the shore. Indenting the coast of Ma

Massachusetts, New York, New Jersey, Delaware, Maryland, Virginia, Albama, and Texas, are large bays, across which the triangle sides pass unobstructed. Even where the sounds narrow down, or the islands lie close to the shore, as in parts of New Jersey, Maryland, North and South Carolina, Florida, and Texas, though the triangles are shorn of their dimensions, their symmetry is still preserved, the characteristic accuracy of the system in its distances and directions remains, and the work is readily executed and progress still rapid. The prairies of the coast of Texas afford great facilities for any scheme of triangulation. This reduces the difficult parts of the coast to so small a span that it is scarcely worth considering, and it is remarkable how the constant tendency is to contract this to still smaller dimensions, and how a close examination develops unexpected facilities, diminishing the resources required in applying a method which is as flexible as it is exact.

The magnetic telegraph has given new precision to this kind of survey just in the point in which it was least strong, and has rendered the measurement of an arc of the parallel an operation of the same kind with the measurement of an arc of the meridian.

The triangulation extends unbroken from Maine to Virginia; has been commenced in North and South Carolina, and in Florida; is completed in Alabama and Mississippi, and commenced in Louisiana and Texas.

The plan of commencing the survey in different sections, resting it in each one upon a carefully measured base, and extending the triangles from these bases until they meet, has been dwelt upon in my former reports, and appears to be generally approved by those who have examined it. The steady execution of such a plan to its conclusion, and a clear idea of the directions in which the work should advance to completion, are required, to realize the advantages of the system. It appears fragmentary while in progress, but the fragments fit—the parts are made by rule, and are uniform in character, and will form, when united, a complete and perfect whole. The loss which may be sustained by arresting any portion of the work cannot fairly be charged against the system.

The operations themselves are so essentially connected, that confusion and loss would be consequent upon any separation of them. The advantage of uniform scientific methods cannot be overrated. Every part of he work has relation to that which is to follow. The reconnaissance is not made for itself, but for the triangulation. The triangles are not laid out for the sake of triangulation, but in reference to the plane-table work and hydrography which are to follow, and the topography in turn adapts tself to the wants of the hydrography. Thus, from first to last there is unison, and without that the result would be disastrous. The astronomical and magnetic observations have the same practical reference. This s by no means the natural course of things, but results from the union of he different parties in one work. It is easily seen that the same facilities do not occur for each kind of operation in the same place, and that if the operations were dissevered, the preceding one might have little value for hat which followed. If the land work is not precisely suited in time and n kind to the hydrographic determinations, it is a serious drawback to the atter; and if made without close and entire connexion with it, the resu would be waste and inaccuracy.

The several operations of the parties have been carried on according directions approved by the Treasury Department on the 23d of March

1849. More or less detailed instructions have been given by me to each of the chiefs of parties on commencing the work of the season, and have been followed up from time to time by others, as the monthly reports or correspondence showed their necessity in executing the plan for the section, in which the operations of several persons and parties employed are combined. Each party keeps a daily journal, an abstract of which is transmitted to the superintendent at the close of the month, with the reports of work done in the different branches of the office. At least once during the quarter, the proof-sheets of the engravings in progress are also sent for inspection. The work in the office, the drawing, engraving, and printing, and, as far as practicable, the instrument making and publishing, proceed according to a programme previously arranged. On closing his season's work, about the first of October, the chief of each party makes a report which contains a summary of his year's work. Personal examinations of the operations of the parties have been made by me where it was practicable, and such verifications by me personally, or by one of the assistants, as time and opportunity have permitted. The amount and character of the work executed appear to me highly creditable to the officers of the survey, and in general there has been great economy in the expenditures. High testimony has been borne both at home and abroad to the character and progress of the work, and the comparisons made by your predecessor of the relative expenditures and results of the survey and of similar ones in other countries, (Ex. Doc. No. 26, 30th Congress, 2d session,) showed a very decided difference in favor of our economy. A comparison which I had occasion to institute in my report of last year with the land surveys, showed that in the matter of actual cost per linear mil surveyed, converting our topographical areas into equivalent linear survey in order to produce similarity of operation, our topographical surveys ha the advantage.

In pursuance of the direction of the law to employ as many officers o the army and navy in the work as practicable, applications have bee made from time to time for officers in both branches of the service. Th hydrography being exclusively executed by officers of the navy, I ha added new parties or vessels whenever the progress of the work in the d ferent sections, and the appropriation from which the surveying expens are derived, would permit. The Navy Department has with great liberali answered these calls, gradually increasing thus the number of its office upon the work, which now amounts to fifty-four—namely, twenty lieute ants, and thirty-four passed midshipmen.*

Within the past year the changes in the officers of the hydrograph parties, from various circumstances, have been so rapid that more than h of those now attached to the survey have been ordered to it since my l report. We have lost three chiefs of hydrographic parties who were m valuable to the work, and whose experience we shall miss, even thou their other qualities may be supplied by their successors. One of th officers, Lieutenant Charles H. Davis, has been selected for the import scientific duty of preparing an American Nautical Almanac; and two othe Lieutenants David D. Porter and Richard Bache, have taken steamers the Pacific.

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* Since this date, the number has been reduced to eighteen lieutenants, and twenty-s passed midshipmen.

While the object of Congress to render the survey a school of applica-
ion is answered by these rapid changes, the work itself suffers in its pro-
gress, from the loss of the experience which it imparts. The knowledge
of the steam engine acquired in our surveying steamers is of itself of great
value to the service, and through it to the country; it is, however, neces-
arily paid for by the survey. The familiarity with the coast and its har-
oors which the officers of the navy acquire by this service is also of the
ighest importance to the country; and the nature of the service and its
onnexion with the science of the country, are favorable to the develop-
nent of those qualities in the younger officers which make them ornaments
o their profession.

The general progress of the coast survey may be thus summed up. In
ne first section, sketch A, (Maine, New Hampshire, Massachusetts, and
Rhode Island,) the primary triangulation and astronomical and other
bservations connected with it have reached Portland, Maine, the minute
econnaissance extending to the Kennebeck, and the general reconnaissance
o the Penobscot. One party, uninterruptedly engaged in this work, could
nish it to the boundary in two to two and a half seasons. A base of
erification has been measured on the Boston and Providence railroad.
The secondary triangulation has reached New Hampshire, and the prepar-
tion of putting up signals has been carried to Kennebunk, in Maine.
The topography has reached Cape Ann, with an interval to be filled on
ne eastern side of Massachusetts bay, from Harwich to Scituate. The
ydrography of the south shore of Massachusetts is complete to Nantucket
ound, embraces nearly the whole of Nantucket shoals, and has been
ompleted in Hyannis, Bass river, and Wellfleet harbors of refuge, and in
oston harbor and its approaches. The rest of the work in this section,
xcept the topography and hydrography of part of Narragansett bay, is
omplete. Observations for difference of longitude, by chronometer, be-
veen Cambridge and Europe, are in progress. The charts of New Bed-
rd, Holmes' Hole, Tarpaulin Cove, Edgartown, and Nantucket harbors,
ave been published. That of Hyannis is engraved. The "general coast
hart" from Narragansett bay to Cuttyhunk, is engraving. So also the
hart of Boston harbor, Muskeget channel, and the second sheet of the
oast chart, are in the hands of the draughtsmen. Two manuscript charts,
n a large scale, of Boston harbor and its approaches, have been prepared
r the commonwealth of Massachusetts and the city of Boston. Prelim-
ary sketches and notices of dangers, and facilities to navigation, developed
the survey, have been published.

The whole field-work of the survey is in general complete in the next
ction, sketch B, (Connecticut, New York, New Jersey, Pennsylvania, and
elaware,) parts of which require an extension of the work, and others veri-
cation, or resurvey. This is done as parties are disposable. The chief ex-
nditure in this section is for drawing and engraving. Two charts of New
ork bay and harbor in six sheets, and one on a smaller scale in one sheet,
ve been published. The atlas of harbors of Long Island sound is nearly
mpleted. Charts of the harbors of New London, New Haven, Black Rock,
d Bridgeport, Oyster bay, Huntington bay, Cawkin's and Sheffield
ands, Captain's islands, east and west, and of Fisher's Island sound,
ve been published. The chart of Sachem's Head is engraved; leaving
ly the mouth of the Connecticut, the anchorage at Hart and City islands,

and perhaps an additional chart, to be engraved. The eastern sheet of the general chart of Long Island sound has been published, the middle sheet is engraved, and the western is in the course of engraving. The western sheet of the south side of Long Island is engraved, and the middle and eastern sheet drawn. The off-shore chart, comprising the coast of Connecticut, New York, and New Jersey, from Block island to the capes of the Delaware, is drawn and nearly engraved. A chart of the passage between East River and Long Island sound, (Hell Gate) has been drawn. Buttermilk channel, in New York harbor, has been resurveyed, and a chart published. The Delaware bay and river, in three sheets, including the approaches, has been published. A chart of Little Egg harbor, (of refuge,) on the coast of New Jersey, has been published. A part of these engraved plates are electrotyped, so as to use copies, which are fac-similes of the original.

In the next section, sketch C, (Delaware, Maryland, and Virginia,) the primary triangulation, and secondary connected with it, will be completed in less than three years, having now reached the Rappahannock in their progress down the Chesapeake. The secondary triangulation on the outer shore is similarly advanced. The triangulation to connect the primary work and the capitol, requires the occupation of but one station to complete it. A base of verification has been measured on Kent island. From the Seaton station, at Washington, we expect to reach all the principal points on the coast through which the telegraph passes, determining the differences of longitude with a precision not heretofore attained. Washington, Philadelphia, New York, Cambridge, and Cincinnati, (one of the steps to New Orleans by the western telegraph routes,) have been thus connected, and the astronomical observations at Western Reserve College have been rendered available for our work by its telegraphic connexion with Philadelphia. The topography in this section, both of the shores of the Chesapeake and ocean shore, has kept pace with the triangulation as nearly as the convenience of the work permits. The hydrography of the Chesapeake has rather pressed upon the land work, and that outside follows it closely. An efficient *steam vessel* is much wanted for this part of the work; otherwise, as the Chesapeake widens and the soundings come to embrace the mouth of the bay outside, the hydrography cannot keep up with the rest of the work. With a steamer which could keep the sea one hundred days during the working season, the main hydrography of this section would be completed in five years, and probably at no greater annual expense than now. Charts of Annapolis harbor and the entrance to Chester river have been published. A char of the Patapsco and Baltimore harbor in two sheets is nearly engraved The upper sheet of Chesapeake bay is drawn and engraving, and the drawing of a second sheet will soon be in progress. Materials for a third will at the close of this season be in the office, and will be at once reduced.

In the fourth section, sketch D, (Virginia and North Carolina,) th main and secondary triangulation of Albermarle sound, and the tertiar triangulation of the rivers emptying into it, except those at its head, an the topography of the shores, are completed. The triangulation Croatan and Roanoke sounds, and the topography of the shores, are nearl completed. A base line has been measured on Bodie's island. The tr ngulation of Currituck sound is in progress, and that of Pamlico sound ommenced. A small triangulation along the ocean shore is in progress o Cape Hatteras. The hydrography of Albemarle sound is two-thirds lone. Hydrographic reconnaissances have been made of the inlets beween Nag's Head and Hatteras inlet. The reductions are in progress or a map of Albemarle sound. The chart of Pasquotank river has een drawn, and is nearly engraved. This is the section having the mallest extent of shore line of the nine sections on the coast of the tlantic and Gulf of Mexico, and the progress of the land work in it, in etween three and four years, amounts probably to one-third of the vhole. Had the steamer Jefferson answered our expectations, we should ave been able to speak as positively in regard to the hydrography.

In section five, sketch E, (South Carolina and Georgia) a general reonnaissance of the coast has been made, so as to decide upon the plan f the work, and to form an idea of the difficulties and facilities in diferent parts of the section. This is one of the newest sections, the work aving been only commenced in it in the winter of 1847-'48. The land vork of Charleston harbor has been completed, including the triangulaion and topography, and the astronomical observations required have been nade. The approaches to the harbor from the ocean have been sounded out. A hydrographic reconnaissance has been made of Bull's bay, on the coast of South Carolina, important as a harbor of refuge. The computations required for the chart of Charleston harbor have been made, and the drawing is in progress. A sketch of the harbor of Bull's bay has been published. The base line for the main work has been laid out on Edisto island, and the arrangements for its measurement are in progress. The sides of the main triangles have been traced from the base to the stations east of Charleston. The small secondary triangulation will be pushed both south into Georgia, and north from the base, so as to serve as a minute reconnaissance for the primary.

The sixth section, sketch F, (part of Florida,) was commenced last winter, by a reconnaissance of the Florida reefs and keys; and, a special appropriation being made by Congress, the triangulation was at once commenced, near Key West and Bahia Honda, and astronomical observations were made for fixing the geographical position of Key West. The rapid advance of summer, and other circumstances, necessarily prevented more than a beginning there, and the parties are now under instructions to resume work as early as the season will permit. Two land parties, (one a double one) and a hydrographic party, have been organized for the purpose. The plan of operations proposed, and the reasons for it, will be described in a subsequent part of my report. More than two-thirds of the part of the coast of Florida which is comprised in section seventh, sketch G, has been reconnoitred, and work may be commenced there whenever the appropriation permits. A hydrographic recconnaissance of the entrance to the St. Mary's and St. John's rivers has been made.

The eighth section, sketch H, (Alabama, Mississippi, and Louisiana,) was commenced by a reconnaissance in 1845, and the work has made very good progress in it. The triangulation of the delta near the city of Mobile, and of Mobile bay and Mississippi sound, to Cat island, and the shores of Lake Borgne, is nearly complete, and the topography more than half advanced to completion. The positions of two points have been determined by astronomical observations. A base line for the work has been measured on Dauphin island. The hydrography of nearly two-thirds of Mobile bay is done, including the entrance; part of Mississippi sound, and Cat and Ship island harbors, are complete. The charts of these harbors have been drawn, and the engraving is nearly completed. The chart of the entrance of Mobile bay is in the hands of the draughtsman. Sketches of hydrographic reconnaissances of Cat and Ship island harbors, and of Mobile entrance, have been engraved and distributed. The work in this section will be recommenced as soon as the season permits.

The ninth section, sketch I, (part of Louisiana and Texas,) was commenced but two years since. Galveston (upper and lower) bay has been triangulated on a base approximately measured. Astronomical and magnetic observations have been made at one station, and it has been connected by chronometer differences with a station in section eighth. It is proposed this season to carry the triangulation south from Galveston, and to commence the topography and hydrography of Galveston bay. The work will be thus in full activity.

Instructions for commencing section tenth (the coast of Oregon) were given by the Treasury Department in July, 1848, and in the course of the autumn a land and hydrographic party were organized to proceed to Oregon. The land party is complete within itself for all the operations of the survey. The very unexpected change in the relations of the western coast has, of course, interfered materially with the usefulness, and added greatly to the expense of the parties. At the last advices, however, the schooner Ewing had arrived at San Francisco, having passed through the straits of Magellan, under the command of Lieutenant Washington A. Bartlett. Lieutenant Commanding McArthur, United States navy, the chief of the hydrographic party, had also, after many delays and difficulties, not to say dangers, reached the same point, and thus Assistant James S. Williams and his party (Brevet Major Hammond, Sub-Assistant Joseph S. Ruth, and William Humphreys, esq.) were furnished with the means of transportation, which had been entirely wanting before, to reach the coast of Oregon. I have no doubt, should our means prove adequate, I shall be able to give a good account of the labors of these parties.

This cursory glance at the work on our extended coast which has been done, will, I trust, serve to give confidence in the steady advance towards completion of all the parts of the survey. In four of the sections data exist for a tolerable approximation towards the time of completion of the different parts of the work, with the means as they now exist; in four others, they will be furnished in three years, making at that time eight of the sections in regard to which the estimates of time of completion may be presented with reasonable pretensions to accuracy. I have endeavored, in passing, to indicate some of the periods when, as now supposed, the operations will be completed.

As the sums directly appropriated for the coast survey, and those indirectly furnished by the War and Navy Departments in supplying officers, and the latter officers and men for the survey, have increased, the rate of progress of the work has been in a higher ratio; and I have endeavored in former reports to show the economy which thus resulted from enlarging the scale of the work, while the period at which its benefits were felt was hastened, as well as that of the entire completion of the survey. Besides the general account just given, it is proper to state the progress during the past year separately from that of former ones. This notice I shall endeavor to render as brief as possible; as a full detail will be given in the subsequent parts of the report of all the operations derived from the reports of the officers engaged in them, and my own examinations. Each individual engaged in a work like this has a right to claim that he shall, as far as the case admits, receive full credit for work done, and the public statement by the head of the survey, of the amount of service rendered, is, at least in part, a fulfilment of his duty in the matter. With many, the opportunity of thus having their labors appreciated by the public, while it is a reward for exertion, also reacts as a stimulus. With all, the occasions of preparing annual reports serve as so many periods of reflection upon progress made, and of plans of operations and their relative degrees of success.

The progress of the survey during the past year, classified under the heads of the different operations, has been as follows:

SECTION I.—PASSAMAQUODDY BAY, MAINE, TO POINT JUDITH, CONNECTICUT.

Reconnaissance, both preliminary and minute, has been carried one set of stations further eastward, reaching thus the Penobscot.

Primary triangulation.—Two stations have been occupied, at one of which observations for *latitude* and *azimuth* have been made; and at both, observations for magnetic variation, (declination,) intensity, and dip.

Magnetic observations were made at six stations to furnish the variation for the harbor charts of Lynnhaven bay, Marblehead, Salem, Gloucester, and Annisquam.

The difference of longitude by the transportation of chronometers between Cambridge, Massachusetts, and Liverpool, England, is in course of determination. The observations of moon culminations and occultations for longitude have been contributed for the use of the survey from Cambridge and Nantucket, and of latitude from Nantucket.

Secondary triangulation.—The preparations by the erection of signals have been completed to Kennebunk, Maine; the measurement of angles has been nearly completed (covering Cape Ann) to Seabrook, in New Hampshire.

The topography of the northern shore of Cape Cod has been carried to Harwich; the topography east of Boston has been carried from near Lynn to beyond Salem.

The hydrography of Nantucket shoals has been continued. That of Bass river and Wellfleet harbors has been completed. The position of Cashe's ledge has been determined. Tidal and current observations have been made in the Vineyard sound. *Four* new shoals (McBlair's shoals) have been discovered in the "main ship channel over the Nanucket shoals."

The usual *computations* of the work of the year have been made in his and the sections generally.

Drawing.—The manuscript maps of Boston harbor have been completed, including additional work to that originally designed, which renders the hydrography more perspicuous. The map of Boston harbor, on a smaller scale for engraving, is more than half done. The chart of Muskeget channel is two-thirds done.

Engraving.—The map of Hyannis harbor has been engraved. Some progress has been made on the general coast chart, eastern series No. 1, and on the map of Boston harbor.

SECTION II.—POINT JUDITH TO CAPE HENLOPEN.

Triangulation has been made, to determine points for the hydrography of the south side of Long Island.

Magnetic observations, for the determination of the coefficients of the needles of two of the declinometers used in the survey, have been made.

Soundings have been made off the south side of Long Island and in Little Hell Gate, and for a profile-line from the entrance to New York harbor. A thorough comparative examination of specimens of the bottom in this section is in progress.

Drawing.—1. The reduction of the topography for the off-shore map, from Point Judith to Cape Henlopen, has been made. 2. A similar reduction for the map of the south shore of Long Island sound has been completed. 3. The topography of the large scale map of Hell Gate is nearly completed.

Engraving.—1. The middle sheet of Long Island sound has been completed. 2 and 3. The charts of Cawkin's Island and Sheffield Island harbors, and of Captain's islands, east and west, have been completed. 4. The re-engraving of the entrance sheet of Delaware bay is nearly completed. 5. The sketch of Buttermilk channel has been engraved. 6 and 7. The western sheet of Long Island sound, and the off-shore chart from Point Judith to Cape Henlopen, have made progress. 8 and 9. Sachem's Head harbor, and the anchorage at City island, have been commenced.

SECTION III.—CAPE HENLOPEN TO CAPE HENRY.

Triangulation.—The primary and secondary work on the Chesapeake has been extended south beyond the Rappahannock, in Virginia. The secondary, on the outer coast, has advanced to Assateague light-house. The tertiary triangulation of the Nanticoke has been made to Vienna.

Astronomical and magnetic observations.—Observations for latitude and azimuth, in connexion with the triangulation between the capitol and Chesapeake, have been made at one of the Chesapeake stations.

Topography.—The topography of the shores of the Nanticoke, Pocomoke, and Wicomico, of Hooper's straits, and of Tangier bay, has been completed. That of the ocean shore has been carried from Sinepuxent bay to Assateague island.

The *hydrography* outside has been carried south from the Isle of Wight shoal to the mouth of Green river inlet. In the Chesapeake, across the mouth of the Potomac to Smith's Point.

Drawing.—The topographical part of the upper sheet of Chesapeake bay is three-fourths done. The results of the resurvey of the Patapsco are nearly reduced.

Engraving.—Chesapeake bay No 1. The upper sheet has made some progress. The chart of Chester river entrance (harbor of refuge) has been engraved. The Patapsco river and Baltimore harbor, in two sheets, has advanced towards completion.

SECTION IV.—CAPE HENRY TO CAPE FEAR.

The *measurement* of a base line on Bodie's island has been made.

The *triangulation*, main and secondary, of Croatan, Roanoke, and urrituck sounds, has been in progress. A tertiary triangulation has een carried on the outer shore, from Nag's Head south nearly to Hateras.

The *topography* of the shores of Albemarle sound, of the Alligator nd Yeopim rivers, has been completed. That of the shores of Croatan nd Roanoke sounds, and of the outer shore from Nag's Head to south f the new light-house on Bodie's island, has been finished.

The *hydrography* of about two-thirds of Albemarle sound, and of the ntrance to the Alligator river, has been completed. Hydrographic reonnaissances of the inlets of 1846, of "New inlet," of Hatteras cove, nd of Hatteras inlet, have been made.

Drawing and engraving.—The sketches of Hatteras cove and Hatteras nlet have been drawn and engraved. The engraving of the chart of he Pasquotank is nearly done.

SECTIONS II, III, AND IV.—Three lines of *off-shore soundings* have been un from the capes of the Delaware to south of Cape Henry.

SECTION V.—FROM CAPE FEAR TO THE ST. MARY'S.

The minute *reconnaissance* has been in progress for tracing the triangle ides from the Edisto base to the stations beyond Charleston.

The *measurement* of a base on Edisto island is in progress.

Astronomical observations, &c., have been made in Charleston harbor, nd those in the city have been continued.

The *triangulation* of Charleston harbor and its vicinity has been made.

The *topography* connected with this, and with the approaches from the cean side, has been executed, and the plan of the city and wharves has een made and copied for the city authorities.

The *hydrography* of the approaches to Charleston harbor from the cean has been nearly completed. A reconnaissance of Bull's bay, north f Charleston, has been made, and the sketch has been *drawn and engraved.*

SECTION VI.—FROM THE ST. MARY'S TO ST. JOSEPH'S BAY.

Astronomical observations have been made near Key West, and the *riangulation* has been commenced at Key West and Bahia Honda.

A *preliminary reconnaissance* has been made from Cape Florida to arysfort, and from the Marquesas Keys eastward to Key Rodriguez.

A *hydrographic reconnaissance* of the entrance to the St. Mary's and t. Joseph's has been made. The work has been re-commenced in this ection by two land parties, (one a double party;) and a hydrographic party, aving a steam-vessel, is in part organized.

SECTION VIII.—FROM MOBILE BAY TO VERMILLION BAY.

Triangulation.—The triangulation of the delta near Mobile is comlete, and of Bonsecours bay is nearly so, finishing very nearly the work n Mobile bay.

Topography.—Parts of the islands south of Mississippi sound, previously unfinished, have been completed. The north shore of Mississippi sound, and part of the shore of Mobile bay, is finished.

Hydrography.—The hydrography of two-thirds of Mobile bay has been done. Tides and currents have been observed at Mobile Point, Cat island, &c. Sailing directions for Cat and Ship island harbors have been prepared. Information in regard to buoys, beacons, and landmarks in Mobile bay, at its entrance, and in Cat and Ship island harbors, has been collected.

Drawing and Engraving.—1 and 2. The chart of Cat and Ship island harbors has been drawn, and part of Mobile entrance is in preparation. The engraving of the first named map, which is of the size of two of the usual harbor sheets, is nearly completed.

SECTION IX.—FROM VERMILLION BAY TO THE RIO GRANDE.

The triangulation of Galveston lower and upper bays has been very nearly completed, so as to prepare for the commencement of the topography and hydrography, which have been directed.

Some part of the operations of the survey (including field and office work) has been thus carried on in every State of the Atlantic, and gulf of Mexico, during the past season, and a beginning has been made on the western coast. The occupation of the several parties is shown in the table in appendix No. 1.

In six sections the work has been in full activity, and in three others preparations have been made for its execution on the same scale. Should the appropriations asked be made, including the special appropriation for the Florida reefs and keys, the continuation of which is requested, I shall be able to keep up the work on the same footing during the next fiscal year. This supposes the same aid from the War and Navy Departments as in past years. Should this be withheld, from any cause, I ought not to be considered as responsible for the consequent derangement of the operations proposed, and the necessary diminution of progress.

The number of actual discoveries made in the progress of the coast survey attests the necessity for it, and its value. It is not too much to say, that no part of the coast has been explored without important developments being made. Sometimes this is the result, no doubt, of changes, which it is not less important to know, to watch, and perhaps to control, than to have certain knowledge in regard to the permanent parts. Of course, the correct delineation of land and representation of the depth of water, the information in regard to tides, currents, buoys, light-houses, &c., constitute the most important results of the survey, and if not a single channel, shoal, or rock, remained to be discovered, the positions of the known should be correctly represented. *Sixteen* distinct discoveries of note were enumerated in a report made by me to the Treasury Department in February, 1849, and these were besides the discoveries of single rocks, and the first sounding out of channels, or shoals. Important changes in the business relations of Mobile have resulted from the discovery of a channel, of twenty-one feet in depth, into the bay, made three years since. The past year has added the discovery of four shoals in the main ship channel over the Nantucket shoals, the determination of the position of Cashe's ledge on the coast of New England, the reconnaissance of Hatteras cove and Hatteras inlet, two harbors of refuge, formed within a few years, which, if locally known or to pilots, were not generally known to navigators. How many lives may be saved by the distribution of these sketches of Hatteras cove, Hatteras inlet, and Bull's bay?

Besides the general idea thus given in reference to the operations and their localities, the amount of work produced shows the results numerically. A table of this kind, which was prepared by direction of the Treasury Department last winter, is appended to the report. (Appendix No. 2.) The numbers have been revised in the office since they were first prepared. The work of the past season not being yet collected at the office, is, of course, not included; but the estimates furnished by the officers of the survey, up to the date of their reports, are stated, in connexion with the notice of the labors of each party.

ESTIMATES.

The estimates which I would respectfully request to be laid before Congress are the same in amount and in division as those which last year received the sanction of the department and of Congress. The minor details only differ in distribution, according to the change of circumstances in the different sections. The estimates include not only the cost of the field operations, as is usual in such works, but of all the computations and reductions, the drawing and engraving, the printing and publishing. They include also the compensations of all persons engaged, except officers of the army and navy, and the men from the navy employed exclusively in the hydrographic part of the work.

General Items.—Rent, fuel, postage; materials for drawing, engraving, and printing; carpenter's work and materials; instrument maker's work and materials; blank books, stationery, printing, and ruling forms; binding; transportation of instruments, maps, and charts, and miscellaneous office expenses; purchase of new instruments, books, maps, and charts - - - $15,500

Section I. *Field-work.*—To extend the primary triangulation in *Maine* eastward, and to make the reconnaissance and astronomical and magnetic observations connected with it; to complete the secondary triangulation of *Cape Ann*, of the coast of *New Hampshire*, and of part of *Maine* nearly to *Kennebunk*, and of part of *Casco bay* (Portland harbor); to continue the topography of the western shore of *Massachusetts Bay* and of *Cape Ann;* to continue the hydrography of *Nantucket shoals* and of the ocean near *Nantucket*, and of part of *Massachusetts bay* and the harbors of *Gloucester* or *Salem;* to continue the observations of the *tides and currents* in the Vineyard sound, including the cost of repairs to vessel and engine, and the fuel for the steam-vessel used in the hydrography, and the hire of a vessel to aid in the soundings: *Office work.*—To make the reductions and computations of the section; to complete the drawing of the general coast chart, eastern series, No. 1, and to commence that of No. 2; to make the drawing of a chart of Bass river and of Wellfleet harbors, and to commence the engraving of the same, and to continue that of the general coast chart No. 1, and to commence that of No. 2; and to continue the engraving of the chart of Boston harbor, will require 33,000

SECTION II. To continue the verification and filling up of parts of the hydrography; to complete the engraving of the western sheet of *Long Island sound;* to complete the engraving of the series of charts of harbors and anchorages of *Long Island sound;* and to complete the engraving of the chart of *Hell Gate,* near *New York,* will require about - - - - - - - $9,00

SECTION III. *Field-work.*—To continue the triangulation of the *Chesapeake* south of the *Rappahannock,* that of the outer shore south of *Assateague* island, in *Virginia;* to make the astronomical and magnetic observations required; the tertiary triangulation of parts of the rivers; to continue the topography of the shores of the *Chesapeake,* and of the ocean shores south of the *Virginia* line; to continue the hydrography of the *outside* and of the *Chesapeake* south from the present line, including the ordinary repairs merely of a steam-vessel, and the fuel for a steam-vessel, and hire of a tender for the outside work: *Office-work.*—To make the computations and reductions required of the work; the drawing of the third sheet of the *Chesapeake bay*; to continue the engraving of the first sheet, and to commence that of the second, will require about - - - - - - - 32,00

SECTION IV. *Field-work.*—To continue the triangulation of *Pamlico sound* and of the ocean coast south of *Hatteras;* to make the necessary astronomical and magnetic observations; to continue the topography of the shores of *Pamlico sound* and of the ocean; to commence the hydrography of Hatteras shoals, and to continue the exploration of the gulf stream off this coast, including the current expenses of a steam-vessel and ordinary repairs: *Office work.*—To complete the drawing of one sheet of the chart of *Albemarle sound* and its rivers, and to commence its engraving, will require about - - - - - - - 24,00

SECTION V. *Field-work.*—To complete the primary and secondary triangulation of the coast between the *Edisto* base and *Charleston,* and to continue it eastward; to commence the secondary triangulation westward from the same base across *St. Helena sound* to the mouth of the *Savannah;* to make the requisite astronomical and magnetic observations; to continue the topography; to complete the hydrography of Charleston harbor and its approaches, and to continue that of the coast of the section westward; to continue the exploration of the gulf stream off this section: *Office-work.*—To make the required computations and reductions; to make the drawing of the map of *Charleston harbor* and its approaches, and to commence the engraving, will require - - - - - - - - - 20,0

SECTION VI—Provided for by special appropriation as last year. (See item for that purpose.)

SECTION VIII. *Field-work.*—To continue the triangulation of *Pontchartrain,* and the secondary triangulation south of the *Chandeleur islands;* the reconnaissance of the mouths of the *Mississippi;* to complete the topography of the northern shores of *Mississippi sound,* and to commence that of *Lake Borgne;* to continue the hydrography of *Mississippi sound* and outside westward of *Mobile bay:* *Office-work.*—To make the necessary calcula-

tions and reduction of the work of the section; to complete the drawing of the first coast sheet, and to commence the engraving; and to commence the drawing of the second sheet of Mobile bay, will require about - - - - - - - -	$20,000
SECTION IX. *Field-work.*—To continue the triangulation southward and westward towards the Brazos, to make the necessary astronomical and magnetic observations; to continue the topography and hydrography of *Galveston bay: Office-work.*—To make the necessary computations, and to commence the drawing of *Galveston bay*, will require about - - - - - -	18,500
SECTION X. *Field-work.*—To continue the general and minute reconnaissance of the western coast, to commence the triangulation and make astronomical observations in connexion with it, and to continue the topography and hydrography, will require at least - - - - - - - - - -	14,000
Total, exclusive of SECTION VI, and including the current expenses and ordinary repairs of steam-vessels, when considered necessary, in the hydrography - - - - - -	186,000
SECTION VI. To continue the survey of the Florida reefs and keys, commenced under the appropriation of the last session -	30,000
	216,000

Should the men required for the survey not be furnished by the Navy Department, the additional sum of $56,000 will be necessary to cover the pay and rations of the number of petty officers and men, according to the scale of numbers and grades heretofore allowed by the Navy Department. It would add much to the efficiency of the work, if the men, instead of being discharged at the close of the surveying season, were transferred from one vessel to another, securing steady employment for good seamen, and that expertness in the particular duties of the survey only to be acquired by practice. This could readily be accomplished, if the men were employed by the coast survey, and from its funds. The plan has many other advantages, and would relieve the Navy Department from the difficulty which led to a delay in shipping men for the survey of the Florida coast and for section VIII—that, under the limitation by law of the number of seamen, the requirements of the vessels-of-war left none available for coast survey service.

SECTION I.—FROM PASSAMAQUODDY BAY TO POINT JUDITH, INCLUDING THE COAST OF MAINE, NEW HAMPSHIRE, MASSACHUSETTS, AND RHODE ISLAND.—(Sketch A.)

The work has made good progress in this section during the past season. Three triangulation parties, two topographical parties, (including in their organization an equivalent to at least three parties,) one hydrographic party with two vessels during the season, and another during part of the season with one, have been at work. Astronomical and magnetic observations have been made by one of the triangulation parties, and by a special party a chronometic expedition for difference of longitude from Europe has been in progress, and other results have been obtained, which will be spoken of in detail. The differences of longitude between Cambridge, New York, and Philadelphia, have been registered automatically, and a first approximation made to the determination of the influence of the time of the propagation of the galvanic current in the results.

The reconnaissance for the primary triangulation has been carried to the Penobscot, and the triangulation has reached Portland, leaving one station in Maine and one in New Hampshire to the south of it to be occupied, and being still in advance of the secondary triangulation which has reached Saco, Maine, with its reconnaissance, and the New Hampshire line, with measured angles. The topography of Cape Cod has been in progress, and that of Massachusetts bay has advanced eastward, so as to include Salem harbor. While the instruments and my party were transferred from the first station which I occupied to the second, I visited all the land parties east of Boston, and inspected their operations and progress.

The hydrography of the Nantucket shoals has been continued with two vessels, (one a steamer,) and Bass river and Wellfleet harbors of refuge have been sounded out. The observations of tides and currents in Martha's Vineyard sound have been in progress. The soundings required to complete the chart of Muskeget channel have been made, and the chart itself nearly completed. The chart of Hyannis harbor has been engraved. Two to three seasons would suffice for completing the primary triangulation in this section, if the time of one party were entirely devoted to it; but, as I have before pointed out, if it is kept in advance of the secondary triangulation and other parts of the survey, all is done that is required—the pushing of it, to the exclusion of my work in other sections, and at periods of the year not best adapted to operations in this region, is not desirable. At the present rate, and with two parties, the secondary triangulation may be completed in about six years. When the large and intricate space about Nantucket is sounded out, the hydrography will make much more rapid progress along the coast. It should be remarked, however that Boston harbor and its approaches have been carefully surveyed, in addition to the work southward of it. The harbors and other sheltered parts of the coast admit of work earlier and later than the open coast Experience has shown that there are not more than eight to ten weeks during the summer, when it is profitable to attempt sounding on the Nantucket shoals—that is, during which it is profitable to have the party ready for the kind of work, and in a neighboring harbor, prepared to run ou and survey whenever the weather permits.

The determination of Cashe's ledge, made early in the season by Lieutenant Commanding Davis, has been of great importance to navigation, and the difficulties attending it, from its distance from the lan and limited extent, have long made it a problem interesting to hydrographers to solve.

Four shoals have been discovered by Lieutenant Commanding McBlai during his first season's work off Nantucket, of essential importance, a existing in the main ship channel over the Nantucket shoals, but n longer dangerous when their localities and the means of avoiding the are pointed out. The particulars of both these valuable acquisitions t the hydrography of the coast are given in the detailed part of this repo and in the appendix No. 3. They have been published in circulars, an made known through the public prints. The place of the shoals has bee marked on the preliminary sketch, which has been gratuitously distribute to navigators and underwriters.

In the beginning of July, Lieutenant Commanding Charles H. Davis was relieved from duty on the coast survey to take charge of the preparation of the American Nautical Almanac, a merited reward for zealous successful services, and for scientific acquirement and capacity of a high order. The coast survey can but suffer from the loss of so able an officer, but no selfish regrets will be allowed to prevail over the good wishes of his former associates, that his usefulness in his new career may be of the quality of that in the old. Desirous to put on record an official expression of the value attached to Lieutenant Davis's services in the coast survey, I addressed to the honorable Secretary of the Treasury a letter, which will be found in the appendix No. 4, with a request that it might be transmitted with his approval, and placed on file in the Navy Department.

1. *Reconnaissance.*—The reconnaissance for the primary triangulation was continued under my immediate direction by Assistant C. O. Boutelle, as far east in Maine as the Penobscot. In July I visited some of the stations with Assistant Boutelle, in order to decide upon doubtful points in regard to the scheme of triangulation, going as far east as Dixmont, beyond the Kennebeck. The State of Maine, though hilly, does not present the facilities for triangulation which had been supposed, but rather a choice of difficulties in a coast work. High hills are very near the shore, but no second range is presented at a convenient distance for extending the length of the sides of the triangles. The scheme, as far as finally determined, is shown in sketch A, the stations extending as far east as Mount Desert, and the stations furthest in the interior being visible from those immediately on the shore.

2. *Primary triangulation.*—Two primary stations have been occupied by me, one in New Hampshire and one in Maine, in pursuance of the plan of using only that part of the season which is most advantageous for the primary work in this section, so long as it can thus be kept ahead of the secondary triangulation. Between the 15th of July and 27th of October, two stations were occupied—Pattuccawa mountain, in New Hampshire, (see sketch A,) and Mount Independence, near Portland, Maine; 662 observations (including in each, one with telescope direct and one with telescope reversed) were made with the thirty-inch theodolite of the coast survey by Troughton & Simms (C. S. No. 1) on seventeen stations, and one elongation mark measuring thirty-eight angles. The area of the work, estimated in the usual way, is 2,090 square miles, and it furnishes one fourth of that necessary to give bases for the shore line from Cape Small, in Maine, to Cape Ann, Massachusetts, which is, not reckoning the minor indentations of the coast, about one hundred and thirty miles. The shortest triangle-side having its vertex at either station is 24 miles, and the longest 66 miles; 183 measures were made with the micrometer for differences of height of the stations. I was assisted in the general work of the stations by George W. Dean, esq., and in a portion of the observations by Assistant C. O. Boutelle.

3. *Astronomical and magnetic observations, &c.*—Mount Independence, near Portland, was occupied as an astronomical station by my party. It is nearly two degrees and a half north of Nantucket, and but thirteen minutes west of it; the arc of the meridian passing through Nantucket, will, however, be prolonged nearly a degree further north by the occupa-

tion of a station in direct connexion with this, increasing considerably the value of the measurement of the arc.

The observations for latitude were made with a new zenith telescope by Simms, of London, (C. S. No. 3,) and the zenith sector, by Simms, described in my report of 1846. The plan of observation was to determine the latitude with the zenith sector, by observations of certain standard stars, and the declinations of the smaller stars used in the zenith telescope with the same instrument, employing these in the computation of observations for latitude with the zenith telescope instead of the catalogue places. The results, stated in my report of last year, of the performances of the zenith sector, pointed out this course, and the trials now made will show conclusively its value. So far, the field computations confirm the advantages assumed for the method. I shall, at another time, present the numerical data for comparison. It may turn out that the errors of the catalogue are sufficiently corrected by multiplying the number of pairs of stars. The observations with the zenith sector were chiefly made by Sub-Assistant George Davidson and myself; those with the zenith telescope and with the transit instrument (C. S. No. 1) for time, in connexion with the other observations, by George W. Dean, esq., under my immediate direction; those for azimuth with the 30-inch theodolite, by me personally, assisted by Mr. Davidson and Mr. Dean. In connexion with the determination of latitude 323 observations were made with the zenith sector on 11 standard and 73 other stars, 174 observations with the zenith telescope by Talcott's method on 35 pairs of stars. For azimuth 52 observations were made on Polaris and delta Ursæ Minoris, near the eastern and western elongations; and 58 on the elongation mark. The same mark by day, and lamp by night, were used for the meridian mark for the transit and for the elongation mark in observing azimuth. For time, in connexion with the foregoing, 101 transits were observed on 16 stars.

A meteorological register was kept at both stations by Mr. J. R. Smead in which 249 observations of the Hassler standard barometer, and 226 o the aneroid barometer, were recorded, and 249 observations of the tempera ture and wet bulb hygrometer, besides miscellaneous observations of forc and direction of wind, &c.

Vidi's aneroid barometer is so promising as a marine barometer, that have taken some pains to keep up the comparison with the standard, o one made in London. The results will be stated hereafter.

Observations for magnetic declination, dip, and intensity, were mad at both stations—at the first by Mr. Dean, and the last by Mr. Davidso —the declination (variation) and intensity with declinometer No. 22, b Jones, of London, (C. S. No. 1.) The observations at Mount Indepen ence were interrupted by frequent magnetic disturbances attendin auroras. Sixty-nine sets of observations for declination on four days three for intensity on two days; and three for dip on three days, wer made at Pattuccawa, and eighty six sets for declination on three days three for intensity on three days, and three for dip on three days, a Mount Independence.

The work was closed, to proceed to section V for the measurement of base line on Edisto island, near Charleston, on the 27th of October.

Magnetic observations were made at or near five secondary stations i this section by Professor George W. Keely, of Waterville college, Main for the charts of Lynnhaven bay, Marblehead, Salem, Glouceste and Annisquam harbors. The instruments used were, for declination unifilar magnetometer, by Jones, of London, in the possession of Professor Keely, and at the latter stations declinometer No. 22, by Jones, (C. S. No. 1.) The observations for horizontal intensity were made with the first named instrument, and for the relative total intensity with two Lloyd needles, with weights. For magnetic dip, a circle by Barrow, with compound microscopes, was used. The dip circle and the Lloyd needles, as well as the unifilar magnetometer, are those heretofore employed in his observations by Professor Keely. At Little Nahant station, 951 observations were made on four different days, including three sets for declination, (variation,) three for horizontal force, two for relative total force, and three for magnetic dip. At Fort Lee, Salem, the local attraction was found so considerable that, after observing in different positions near each other, the station was abandoned. Codden's hill (see sketch A, secondary triangulation near Salem) was examined for the same purpose, and the local attraction found also to be great there; and Baker's sland was finally fixed upon for the full set of observations. Eight hundred and forty-one observations were made on four different days at this station, comprising three sets for declination, with declinometer No. 22, three for horizontal force, and two for dip. At Codden's hill, 217 observations were made on five different days for declination, with declinometer No. 22. At Beacon hill, near Gloucester, 1,100 observations were made on six different days—namely, five sets for declination, with the unifilar, three for horizontal intensity, two for relative total intensity, and two for dip. The declination was also observed at Annisquam, on the north side of Cape Ann, and comparative dip observations to detect ocal disturbance; which, however, was not found to exist.

The observations for difference of longitude between Cambridge and Liverpool by the transportation of the chronometers of the British mail steam vessels of the Cunard line have been continued by Professor W. Cranch Bond, who has furnished eighty-seven additional observations during the year. The difficulties attending the procuring, in an authentic scientific form, of the observations for time at Liverpool, and the consequent uncertainty introduced into the determinations, induced Professor Bond to propose to me, in the spring of last year, to undertake a special expedition, in which chronometers belonging to the survey, or hired expressly for the purpose, and arranged for the expedition, should be transported with special reference to it, between the observatories of Cambridge, Massachusetts, and Liverpool, England.

The general plan was matured in consultation with Mr. Bond and Assistant S. C. Walker, and the execution was confided to Mr. Bond. Mr. Hartnup, director of the observatory at Liverpool, entered with great zeal and assiduity into the plan, and has contributed most essentially to ts success. All the arrangements for procuring and transporting the chronometers, and for their speedy and safe delivery on their arrival at Boston and Liverpool, have been made by Mr. Bond, with the kind assistance of Mr. Hartnup. The observers on the two sides have adopted, or the most part, the same Nautical Almanac stars in obtaining their local ime; and the same forms of reduction and the personal equations have been obtained through Mr. Richard Bond, who made comparisons with the observers at Cambridge and Liverpool, and took charge of the chronometers n the first trip from England. The number of chronometers compared is orty-four, of which fifteen are by Fletcher, twelve by Dent, and the rest by other makers. These have been transported in the Cunard steam vessels under charge of their officers, being separated into sets for the purpose of varying the circumstances of the voyages, and of increasing the opportunities of observation soon after their arrival at each observatory within the limited season during which it was judged expedient to prosecute the expedition. It is proposed to resume the operations as soon as the season again becomes favorable. The results already obtained are of decided interest, indicating a change in the longitude, as given by astronomical observations, of nearly two seconds of time.

Professor Bond has furnished observations of 18 occultations (12 immersions and 6 emersions) between the 1st of January and 27th of September, 1849. Several of these occultations were observed by more than one observer, the number of results communicated being 26.

Mr. Bond, and his assistant, George P. Bond, esq., also took part in the telegraphic observations for difference of longitude in January and July and August last, when the records were made by the methods devised by J. J. Speed, esq., and Doctor John Locke.

The astronomical observations at Nantucket for the use of the surve have been continued during the past year by William Mitchell, esq., wh reports 94 observations of transits of the moon and of moon culminatin stars; 8 occultations; 116 observations for latitude, with the prime vertical transit; and 120 meridian passages for time, with the West Point repeating circle.

A very interesting report of Professor O. M. Mitchell, of Cincinnat on the mechanical record of astronomical observations, will be found i the appendix No. 5. Professor Mitchell gives a brief account of his fir experiment on the 26th of October, in recording the successive second indicated by the pendulum of a clock upon a Morse telegraphic registe and of the experiments immediately following this; a more extende notice of his disc for recording right ascensions, one of the most perfe of the methods of registering now in use, and which was communicate to me in February, 1849, and indicates the degree of accuracy attaine already by this method, and the saving of time which it effects in obse vations of right ascensions. The report then goes on to describe a m chanical method for registering differences of declination, which is in t highest degree ingenious, and the results of which are so directly a plicable to our work, that I have induced Professor Mitchell to underta by it the measures of the declinations of the small stars used in o zenith telescope observations.

4. *Secondary triangulation.*—One secondary triangulation party h been occupied during the whole season, and a second during part of in this section, and the work has advanced satisfactorily. The second triangulation of the western shore of Massachusetts bay has been co pleted, that of Cape Ann has been completed and carried nearly the boundary line of Massachusetts, and the preparations for measuri angles are finished along the coast of New Hampshire as far east as K nebunk.

The secondary triangulation party of Captain T. J. Cram, Unit States topographical engineers, assistant in the coast survey, took field about the 15th of June, and left it on the 26th of November. T first work was the determination of Chatham south light, Cape C the second, the connexion of the secondary triangulation of the west side of Massachusetts bay with the work of Assistant C. O. Boute coming southward from Boston harbor. Sketch A shows the mode of making this connexion, and the tertiary triangulation for the plane-table work, which was commenced in the early part of the season and completed at its close. This part of the coast includes the mouths of North and of Green's river which Captain Cram refers to, the one as formerly used and the other as still available for a refuge for coasters between Boston and Cape Cod. In August, Captain Cram proceeded to reconnoitre for a secondary triangulation of the coast of New Hampshire and Maine, from Seabrook, New Hampshire, to Saco, in Maine. The scheme is shown in sketch A, connecting with the secondary triangulation of Mr. Boutelle on the south, and having lines of verification from the primary work at both extremities, and also forming a connexion with the minute survey of Portsmouth harbor by Captain Stansbury, of the topographical engineers. It has been laid out so as to avoid, as far as practicable, the necessity of opening any of the lines by cutting. In his report on the season's work, Captain Cram remarks: "This reconnaissance includes no less than seven seacoast harbors, viz: in New Hampshire, Hampton, Rye, Little Harbor, Portsmouth; and in Maine, York, Neddeck, Ogunquit, Wells, Kennebunk, Cape Porpoise, and Winter harbor; all of which are harbors in actual use by vessels of considerable draught of water, and of which, with the exception of Portsmouth, and perhaps Kennebunk, very inadequate, if, indeed, any charts at all are in existence."

"I have not only given particular attention to those enumerated in your general instructions, but have attended to all the natural harbors actually in use and coming within the limits of my reconnaissance. You will see on the sketch that I have fixed upon stations adjacent to their entrances, which I have taken particular pains to place so as to give tertiary triangle sides that will become convenient bases for the surveys of these harbors, as well as to make them serve the general survey of the coast line."

The work of last season was computed and turned into the office by Captain Cram before taking the field.

The party of Assistant C. O. Boutelle resumed the secondary triangulation of Cape Ann in June, Sub-Assistant C. P. Bolles assisting. This work was interrupted from time to time by Mr. Boutelle's duties in connexion with the primary triangulation, especially by the reconnaissance for its extension, already referred to. Between the 21st of August and 6th of October Mr. Boutelle completed the secondary work as far east as Rowley, Massachusetts (see sketch A,) having occupied all the stations of the first order. Eighteen stations were occupied, at five of which 110 angles were measured on 107 objects by 1,173 observations with the two-feet theodolite (C. S. No. 2;) at thirteen others 166 angles were measured on 169 objects by 1,260 observations with an eight-inch repeating theodolite by Gambey (C. S. No. 24.) A more powerful telescope than that originally accompanying the instrument, had been attached to the Gambey instrument by Temple, of Boston. Vertical angles were observed at 16 stations, 189 zenith distances (for elevation) having been measured on 158 objects by 1,884 observations. Mr. Boutelle remarks, "In closing this portion of the work it affords me pleasure to state that in the four seasons' work, and in upwards of 40 triangles, there is no triangle in which the error equals a second to an angle. This freedom from great error I ascribe chiefly to the fact that much care has been taken to insure mechanical accuracy in the adjustment of the signals. Wherever large errors have appeared they have almost invariably been traceable to this cause, which, it appears to me, is one of the greatest, if not *the* greatest, source of error we have to guard against in triangulation, where the sides are comparatively short."

On closing his work on this section, Mr. Boutelle commenced at once the preliminary arrangements for the measurement of the base on Edisto island, South Carolina.

5. *Topography.*—Two topographical parties have been employed in this section—one on Cape Cod, and the other with an organization which was equivalent at least to a double party, east of Boston, in the vicinity of Lynn, Marblehead, and Salem. The area surveyed is 65 square miles, the extent of shore line 201½ miles, and of roads 91 miles.

The party of Assistant H. L. Whiting commenced work in July, and on the 10th of October had completed 26 square miles of area, 27½ of shore line, and 54½ of roads. (See sketch A, sheets Nos. 34, 35, and 36.) The assistants in the party were J. M. Wampler, esq., and A. M. Harrison, esq. Mr. Whiting explains the reasons why more than one plane-table sheet was not in progress at the same time, which, combined with the intricate character of the topography, prevented more rapid progress. The instruction of the assistants of the party is, of course, of great value to the survey.

In addition to this work, about 26 miles of low-water line in Boston harbor were determined.

The topographical sheets of the previous season were in general put in ink by Mr. Whiting before leaving the office in July, including those at Cape Cod and at Hell Gate, and also the lettering and inking of some sheets of former years.

The verification of the topographical work of last year was made in part, in September, by Captain A. A. Humphreys, United States topographical engineers, assistant in the coast survey, and was in the highest degree satisfactory.

The party of Assistant J. B. Glück was transferred from Section III about the middle of July, and up to October 1st had surveyed 39 square miles on Cape Cod, (see sketch A, sheet No. 28,) 174 miles of shore line and roads, besides determining 111 miles of low-water line and 28 rocks and ledges in Boston harbor, and the position of the new light-house nea New Bedford. During the period when Mr. Glück was engaged in determining the low-water line of Boston harbor, the topography of Cape Cod was continued by Isaac H. Adams, esq., assistant in the party.

6. *Hydrography.*—The hydrography of the Nantucket shoals has been continued, the harbors of Bass river and of Wellfleet have been sounded out, and tidal and current observations in Martha's Vineyard sound hav been in progress. By request of the collector of New Bedford, the positions of the two new light-houses near that city were determined, and some additional hydrographic examinations made.

The position of the dangerous ledge of rocks called Cashe's ledge, o the coast of New England, was satisfactorily determined in June last b Lieutenant Commanding Charles H. Davis, United States navy, assistan in the coast survey, in the steamer Bibb. In my report of last year stated the circumstances which led to an attempt to determine the positio of this ledge by Passed Midshipman Daniel Ammen, United States navy under the direction of Lieutenant Commanding Davis As early as th season would permit, and while the fishing vessels were yet in the vicinity of the shoal, Lieutenant Commanding Davis proceeded to carry into execution his proposition of last year, and was so fortunate as to find the ledge, and remained at anchor on it, sounding the vicinity in boats, for twenty-four hours. The least depth of water found on the rock—which Lieutenant Commanding Davis proposes to call "Ammen's rock" in compliment to the difficult enterprise of Mr. Ammen last year—was twenty-six feet. Its position, as thus determined, is in latitude 42° 56′ north, longitude 68° 51½′ west.

" The latitude and longitude of this rock recently given by the best authorities is 42° 44′ N., and 69° 03′ W.," quantities which are quite erroneous. Lieutenant Commanding Davis's report, given in the appendix No. 6, embodies the interesting particulars of this important determination. The name of "Ammen's rock," which he suggests, will be adopted in our charts; and it is received by the British authorities, as will be seen by the etter from the hydrographer of the admiralty, Rear Admiral Beaufort, which follows Lieutenant Commanding Davis's report in the appendix. (Appendix No. 7.)

The hydrographic party under Lieutenant Commanding Charles H. Davis, U. S. N., commenced their work on Nantucket shoals in July, and soon after Lieutenant Davis was relieved from duty on the coast survey, and the charge of the party devolved on Lieutenant Commanding Charles H. McBlair, by whom the work was continued until the first week n October. The steamer Bibb, the schooner Morris, under the command of Lieutenant Commanding J. N. Maffitt, and a tender, were assigned to he work of the shoals; at its close the tender was discharged, and Lieut. Commanding Maffitt proceeded to Wilmington, Delaware, to repair the chooner Gallatin, for the continuation of the survey of Charleston harbor.

The usually short season on the shoals was this year much interrupted by gales and fogs. " The general chart of the shoals has been considerbly enlarged by work done to the southward of New South shoal, southward and westward of Old Man, and to the northward and northward nd eastward of all the shoals; and in addition, a great deal of filling in work has been accomplished on the work of previous seasons." The rea included in this work is 353 square miles, the number of miles run n soundings 746, and the number of soundings taken 8,236.

The four shoals discovered by Lieutenant Commanding McBlair, in what is known as the " main ship channel over the Nantucket shoals," re marked on sketch A, and are described in the appendix No. 3, in which Lieutenant Commanding McBlair's report is given in full. The hoalest has nine feet of water upon it, the deepest fifteen, and the two thers fourteen. The group lies between 85° 40′ E. and 87° E. (true) rom Great Point light, and between 9.5 and 10.7 nautical miles in distance, nd can be recognised, except at slackwater, by the ripple on them, and n daylight at slackwater by the discoloration of the water.

Two spots of small extent were also discovered, having eighteen feet of water on them at low water, and bearing from Great Point light 85° 40′ E., distant 9.8 nautical miles; and 85° 10′ E., distant 11.2 nautical miles.

Lieutenant Commanding McBlair remarks: " The importance of the discovery of the small shoals in the ship channel over the Nantucket shoals

I need not advert to particularly, as this has already been made the subject of a special report.

"Nothing could more fully exhibit the benefits conferred by the coast survey upon the navigating interests of the country, than the detection of dangerous shoals in the very track of large fleets of merchant vessels of all nations, which were entirely unknown before to the oldest and most experienced pilots, and it is still a mystery to me that they should so long have escaped observation."

The area of the work in Bass river harbor is 33 square miles, the number of miles run in sounding 190, and the number of soundings made 7,926. The chart of this harbor and of Wellfleet will be at once reduced for engraving. The importance of Wellfleet harbor will appear from the following extract from the report of Lieutenant Commanding McBlair:

"Our next operation carried into effect your instructions relative to Wellfleet bay. This harbor was thoroughly surveyed from the head of the bay to the southern shore, and far enough to the westward to embrace the shoal making out from Billingsgate island, almost 4½ miles W. by S. In the progress of this work, we determined the positions of several dangerous rocks that were known only to the fishermen, and some but vaguely known to them.

"It will not escape your attention that the determination of the shoals in the neighborhood of Billingsgate island furnishes a valuable addition to the chart of our coast by indicating a secure and accessible harbor of refuge under the lee of those shoals, to vessels which, in doubling Cape Cod in northerly gales, are driven too far to leeward to reach Provincetown The area comprised within the limits of our work at Wellfleet consists o 49 square miles; the sounding lines, run chiefly by the boats, may be computed at 301 miles, and the casts of the lead obtained amount in numbe to 9,906."

While in the harbor of New Bedford, Lieutenant Commanding Maffit determined the position of the new light-house on Palmer's island, by request of the collector of the port.

During last winter the party of Lieutenant Commanding Davis wer engaged in plotting the charts, reducing the tidal and other observations and representing on diagrams the observations of currents of the previou year. The tidal observations at Old Point Comfort for 1847, were als reduced. The services of Lieutenant Commanding Davis in section will be mentioned in their place.

The phenomena of the tides in the Vineyard sound are of considerabl practical interest, and the investigation was commenced towards the close the season, by the party under the command of Lieutenant Commanding R. Goldsborough, U. S. N., assistant on the coast survey. Part of t scheme laid down in my instructions for combined tidal and current o servations has been successfully carried out, and I expect to derive fro the results valuable indications for the further prosecution of the wor The tidal stations were occupied for one lunation. Three of these we on the north side of the Elizabeth islands, within the influence of t tides of Buzzard's bay, (see sketch A,) and three in the Vineyard sou itself, two of the stations being respectively at the entrance of "Quick Hole" and "Wood's Hole," from Buzzard's bay, and two others at t Vineyard sound entrance of the same passages. The tide gauges we attached to tripods, placed in between five and six feet of water at low tid Meteorological observations were made in connexion with those of the tide

Four of the current stations selected for simultaneous observations were occupied before October 23d, when the advance of the season rendered it expedient to discontinue the work.

I take great pleasure in expressing my sense of the generous effort of Acting Master E. C. Stout, and Passed Midshipman D. P. McCorkle, U. S. N., on coast survey service, and the crews of the boats from the schooner Nautilus, in rescuing, at considerable peril to themselves, the lives of three persons in the Mount Prospect, of Falmouth, Massachusetts, capsized by a heavy squall of wind on the evening of the 24th of October. The report of the circumstances of the accident and rescue, as given by Lieutenant Commanding Goldsborough, is in the appendix No. 8.

The revision of the sailing directions of New Bedford harbor having become necessary from the erection of two light-houses, which furnished new ranges, and much facilitating entrance to the harbor, Lieut. C. Raymond P. Rodgers was detailed for this service, which he performed in a very acceptable manner. A new edition of the chart of New Bedford harbor will soon be issued. The coast survey is indebted to the Hon. Joseph Grinnell, to the collector of the port, and to Captain J. C. Delano, for facilities afforded in this work.

SECTION II.—FROM POINT JUDITH TO CAPE HENLOPEN, INCLUDING THE COAST OF CONNECTICUT, NEW YORK, NEW JERSEY, PENNSYLVANIA, AND PART OF DELAWARE.—(Sketch B.)

The work in this section has been of the usual miscellaneous character of supplementary work, and has been executed as parties have been available from other sections. The chief operations have been hydrographic, and of these the verification work on the south side of Long Island has occupied the largest portion of time. The re-examination of the *entrance* to New York harbor has shown that no considerable or important changes have taken place in the shoals or channels since the first examination by the coast survey. The survey of Hell Gate and its approaches has been completed. Buttermilk channel has been buoyed out, and a sketch of it has been engraved and distributed, through the collector of New York; it is also appended to this report, (sketch 13, No. 2.) The progress made in the engraving of the charts of this section will be given under the head of office work.

1. The determination of points on the south shore of Long Island, to fill up the hydrography, has been continued by Professor Pendleton, United States navy, under the immediate direction of Lieutenant Commanding Augustus S. Baldwin, United States navy, assistant on the coast survey. The observations on the surveying vessel, required from the shore stations in the hydrography, were made by Professor Pendleton and Alexander S. Wadsworth, jr., esq.

2. The astronomical observations made with the West Point mural circle for the declinations of the stars, giving discrepant results for latitude, were reduced by Captain T. J. Lee, of the United States topographical engineers, and placed in the archives of the survey. In October last Captain Lee was, much to my regret, detached from the survey. I take this opportunity to express the high sense which I entertain of the value and efficiency of his services to the coast survey during the four years which he was connected with it, of the unwearied assiduity with which the work intrusted to him was performed, of his skill and tact in observing,

and of the admirable steadiness and perseverance in the execution of well-laid plans of working, which always insured results of the highest value.

3. Professor Kendall has continued the astronomical observations at Philadelphia for the use of the coast survey. Forty-one moon culminations, 135 transits of moon culminating stars, and 21 occultations, have been observed.

Professor Kendall also assisted in the operations for difference of longitude, by telegraph, in January and in July and August last.

4. Sub-Assistant Joseph S. Ruth determined the coefficients for the moment of inertia, and of temperature of the magnetic needle used with declinometers Nos. 22 and 20 of Jones, (C. S. Nos. 1 and 2,) by an elaborate series of experiments continued during six weeks. For the facilities of making the observations Mr. Ruth was indebted to Doctor R. M. Patterson, director of the United States mint, and especially to Franklin Peale, esq., chief coiner, who, at considerable personal inconvenience, gave him a room for his work, in which the requisite variations of temperature could be obtained.

5. Professor Loomis assisted at the Rutherford station, in New York, in the telegraphic observations for difference of longitude in January last, of which a special report was made to the department, communicated to Congress, and printed by their order, (Ex. Doc. No. 21, 2d session 30th Congress.) The coast survey is under obligations to the Hon. F. O. J. Smith, and to B. B. French, esq., for the facilities afforded them in these operations.

6. The hydrography of verification of the south side of Long Island has been continued by Lieutenant Commanding Augustus S. Baldwin, United States navy, assistant in the coast survey, in the schooner Nautilus. The work was commenced in August, and closed in October, during which time 360 square miles were sounded, 3,000 soundings made, the average depth of which was 52 feet, and range from 9 to 104 feet, and 250 miles sailed over in sounding. The inlets of Fire island, Gilgo, New inlet, Hog island, and Rockaway, have changed considerably since the former surveys, the channel in each having moved to the westward. An inlet has formed between New and Gilgo, of about the same depth as the former. The difficulties encountered in this work were of a very unusual kind, but were satisfactorily overcome.

Lieutenant Baldwin was assigned to the charge of this work in consequence of the illness of Lieutenant Goldsborough, United States navy, commanding the schooner Nautilus.

7. Additional soundings at the entrance of Connecticut river were made by Lieutenant Commanding J. R. Goldsborough, United States navy, assistant in the coast survey, in June last, and the hydrography of the river was extended to the ferry above Essex, where the triangulation terminates.

8. The sailing directions for the middle and western sheets of the chart of Long Island sound, and for Greenport and Sag harbors, have been made by Lieutenant Commanding Charles H. Davis, and the positions of the buoys in Greenport harbor have been determined by Professor Pendleton.

Lieutenant Commanding Davis recommends two additional buoys at Greenport, "one a channel buoy, to be placed at the entrance of the harbor in from three to four fathoms of water, (at low water;) and the other a buoy n the ridge of the shoal ground skirting the south side of the channel pposite that off Long Beach point. The course in would lie between hese buoys."

9. During the winter, until relieved from duty on the coast survey, Lieutenant Commanding D. D. Porter, United States navy, was engaged n plotting the work executed by him in and near Hell Gate. The topographical sheets of Assistant H. L. Whiting, containing a minute re-survey of the shores of this passage, were drawn in ink, the shore line transferred, and a copy on the large scale commenced for the Chamber of Commerce of New York.

10. The soundings of Little Hell Gate, in connexion with the xaminations heretofore made by Lieutenant Commanding Davis and Lieutenant Commanding Porter, for ascertaining with precision the bstructions in that important passage, were made by Lieutenant Maxwell Woodhull, United States navy, assistant in the coast survey. The oundings were commenced at the mouth of the Harlem river, and the bstructions from natural and artificial obstacles carefully examined. Lieutenant Woodhull remarks:

"Little Hell Gate passage, which lies between Ward's and Randall slands, connecting Harlem river with the main eastern approach to Great Hell Gate passage, I have examined most minutely. I find this could be made a most useful passage for small vessels bound either to the westward or eastward, and very much relieve the main passage during a rowded stage of the tide, and thereby prevent many accidents which ow occur from that very cause. Besides, another advantage to navigation would be gained, of no less importance than what I have already suggested; it would relieve the vessels bound from the eastward, to and from Harlem, from the necessity of encountering the dangers of Hell Gate passage, and materially shorten the distance. There are two or three rocks to e removed, which form the rapids and obstruct the channel: the main and argest one, called the "Hog's Back," a narrow ledge fifteen to eighteen feet ong, sharp and pointed near the surface, and at the base probably four to ve feet in width, lying directly across the channel, could be easily destroyed by blasting. The strata of the rocks are vertical, as indeed is all he formation in and about this vicinity. The second one is close to it, nd could be removed in like manner. The third, a flat rock of considerable size, in and on one side of the channel, between what is called the "Sunken Meadow" and Ward's island, is the only one in this part of he passage, and is partly exposed at low water. I would recommend hat a beacon be placed upon it, which would answer every purpose to how its vicinity, and would cost a mere trifle. If these rocks were emoved, there would be a good passage through, with sixteen to seventeen feet of water at low tide; the current, which now runs at the rate of ix to six and a half miles the hour, would be greatly diminished if these mprovements were made. The average rise and fall of tides are six to even feet."

Lieutenant Woodhull also rendered valuable service in the placing of uoys in Buttermilk channel, and in the harbor of New York generally. The coast survey is indebted to him for acceptable service in connexion with the transfer and fitting out of the steamer Jefferson.

11. The map of the progress of Sandy Hook was completed during the winter by Sub-Assistant S. A. Gilbert, from his re-survey made in the

autumn. The point of the Hook has made very little progress northward since the last survey, in 1846, by Lieutenant Charles H. Davis. A comparative map was drawn and transmitted to the Chamber of Commerce of New York, and a copy furnished to the committee of pilots.

A trace of the land work and of the hydrography of the entrance, from the new survey and the former, for comparison, was furnished to the board of engineers through Major Delafield, United States corps of engineers.

12. A thorough comparative examination of the specimens of the bottom, obtained in this section, has been in progress by F. Pourtales, esq., under suggestions from Professor Baily and Professor Agassiz. At the date of Mr. Pourtales's report (September 29) more than seven hundred and fifty specimens had been examined, and the classified results of the physical characters and microscopic examinations entered in tables. A comparison has also proceeded, in connexion with this, of the descriptions affixed to the specimens when brought up, and they have been examined both wet and dry. In his report Mr. Pourtales remarks: "All the sand covering the bottom of the sea off Long Island and New Jersey appears to be composed of the constituent parts of granite or sienite, viz quartz, feldspar, hornblende and mica, quartz being always preponderant. The proportion of the other materials makes the difference o color. This difference in the proportion, together with the degree o fineness, varying from pebbles to mud, must be the result of a kind o winnowing process produced by the combined action of tides, waves and currents."

The study of the distribution of the organic remains according to depth which is the prevailing circumstance, is of great interest to the naturalist and is readily deducible from that in progress by Mr. Pourtales for ou special purposes. That this subject admits of a real application in th hands of navigators, will not be doubted by anybody who will take th trouble to look at the specimens of bottom containing these animal remains with a common pocket lens, or even a reading glass. Mr. Pourtales remarks: "The difficulty of using a compound microscope at sea ha made me at first diffident of the practical utility of this study, but I fin now that for all purposes, except those of the zoologist desirous of distinguishing sub-genera and species, a lens of small power, or even the nake eye, is amply sufficient." After a few minutes bestowed on such a examination, by a person undertaking it for the first time, it is curious t see the interest which it excites, and the facility with which some of thes specimens are recognised by the naked eye. Many of the species are s large that they can readily be picked out from among the sand with th point of a penknife. This thorough examination by one person wi secure uniformity in our off-shore chart, and has already suggested mor than one "remark;" and, in regard to the examination of the minute an mal remains, "should there be any well characterized species circumscribed in a well determined space, and abundant in individuals, so as t give a good clue to navigators in regard to their position, the fact cann escape being brought to light by the present mode of working."

13. The importance of correctness in the names of localities upon ou charts, and their orthography, is obvious, and the want of precision i the sources of information, to which the parties of the survey must necessarily trust, is very great. To remedy this, when the chart of New Yor

bay and harbor was about to be published, at the suggestion of the Hon. John C. Spencer, then Secretary of the Treasury, I waited upon the representatives in Congress of the different districts, parts of which were ncluded in the map, and obtained the names of individuals who were ikely to give the information sought in regard to the orthography of particular localities. The same method has been taken in other cases, with very variable degrees of success. After conferring with the Hon. Mr. Marsh, and other gentlemen, who were possessed of special information on this subject, it was determined to refer each map, as the names were placed upon it, to a gentleman conversant with the history of the parts of the coast, and the languages from which the names of particular places might have been introduced. The Hon. H. C. Murphy, of Brookyn, Long Island, examined the localities contained in the eastern sheet of Long Island sound before its publication, and has since taken up the middle sheet, furnishing, in a report, a catalogue of some two hundred names, with remarks, derivations, and orthography, most valuable for mmediate use and future reference.

SECTION III.—FROM CAPE HENLOPEN TO CAPE HENRY, INCLUDING THE COAST OF DELAWARE, MARYLAND, AND PART OF VIRGINIA.—(Sketch C.)

The usual number of parties have been employed in this section during the season, with additional force in the organization of a portion of them. All he operations of the survey, including reconnaissance, astronomical and magnetic observations, triangulation of different grades, topography and hydrography, have been carried forward. The localities of work have chiefly been in the southern part of Maryland, eastern and western shore, and the northern part of Virginia. The triangulation has covered an area of 706 square miles, the topography an area of 234, with an extent of shore line of 581 miles, and the hydrography an area of 358 square miles, including 98 square miles of in-shore and outside work, and exclusive of about five hundred in length of sounding lines of off shore work, extending into the next section.

1. The primary triangulation and secondary connected with it will reach the capes of the Chesapeake in less than three years, if continued at the present rate. The outside triangulation will meet the other at, or precede it to, Cape Charles. The topography of the outside shore, and of the shores of the Chesapeake, will keep pace with the triangulation. If an effective steam vessel were provided, the hydrography inside of the bay and out, in and off-shore, could nearly, if not quite, keep up with the land-work until it reaches the widest parts of the bay and the approaches to the capes from outside. Such arrangement would secure the completion of this section, exclusive of the rivers, the land-work in three years, the hydrography in about five, and without drawing unduly from other sections to complete this one. A special appropriation for a suitable and efficient vessel, not delaying the work and requiring constant expenditure by the necessity for repairs, would secure this desirable result and would be economical in the end. The details of the different operations will be found under their several heads.

2. *Astronomical and magnetic observations and triangulation.*—One station on the Chesapeake was occupied by me before proceeding to section I, in May and June—namely, Marriott's, near West river, (see sketch

C,) at which the following observations were made: For latitude with the zenith telescope, (C. S. No. 3,) by Simms, of London, 148 determinations on 36 pairs of stars, using Captain Talcott's method. For azimuth, 158 observations (calling one measure telescope direct and one telescope reversed, an observation,) on Polaris, beta, delta, zeta, and lambda Ursæ Minoris, with the two-feet theodolite of the coast survey, referring the position of the stars to a mark sufficiently distant to admit of the use of the sidereal focus. For time in connexion with the foregoing, 67 transits of twelve standard stars were taken.

The magnetic declination was observed by declinometer No. 22 by Jones, of London, (C. S. No. 1,) and 130 sets of observations made The total horizontal intensity was observed with the same instrument two sets of observations being made. The dip was observed with a 10-inc circle by Gambey, (four sets of observations;) and also with a 6-inch circle by Barrow, with compound microscopes for reading and the readin circle placed in front of the needle, (260 observations;) 576 observation for testing the roundness of the axles of the needles were also made in different azimuths. The changes in the ordinary arrangement of the di circle just alluded to did not strike me favorably on using it.

I was assisted in these observations by Sub-Assistant J. Hewston, jr., an by George W. Dean, esq. The observations with the zenith telescop were in general made by Mr. Hewston.

For connecting the triangulation of the Chesapeake with Washington (see sketch C,) and verifying the work, 231 observations (462 measures were made on five stations with the two-feet theodolite of Troughton an Simms, (No. 2, C. S.) The area of the work computed in the usual wa was 79 square miles.

The following observations were made under my immediate direction b Sub-Assistant John Hewston, jr., at one of the stations of the secondar triangulation, near the north end of Kent island, and were intended t furnish the magnetic variation required for the chart of the harbor of refug at the mouth of Chester river: For magnetic declination, 122 sets of observations with declinometer No. 22, (C. S. No. 1.) For absolute hor zontal intensity, four sets, including those for the moment of inertia, wit the same instrument. For dip, with the Gambey circle before referred t three sets of observations were made.

3. *Differences of longitude by telegraph.*—During the summer, obse vations were made for connecting the "Seaton station" with Weste Reserve College, so as to bring into use for the longitude of our statio from Europe the observations of moon culminations and occultations ma by Professor Loomis at the Hudson observatory, and since reduced bo by Professor Loomis and Lieutenant Gilliss. The instruments at th stations are automatic, on the plan of Joseph Saxton, esq., registering o a metallic cylinder, or cylinder covered with paper, the circuit being ma and broken by the pendulum of the clock.

Every facility was furnished by the honorable B. B. French for usi the telegraph line between Washington and Philadelphia, and by J. Reid, esq., for the western telegraph lines—the local superintenden making great efforts to prevent interruption to our work from the cons quences of the prevalence of epidemic cholera. The thanks of the surv are also due to the honorable Elam Alexander for his liberal offers in r gard to the use of the southern line of telegraph, and to Henry O'Reill ɜsq., for the facilities which he has rendered to us on his lines. It will be ı matter of great interest to reach New Orleans both by the western and outhern routes, for which Cincinnati offers on the one side an intermeliate station through the arrangements with Professor O. M. Mitchel, and Charleston on the south through those of Professor Lewis R. Gibbes.

The correspondence with Elam Alexander, esq., president of the Washngton and New Orleans telegraph line, is given in appendix No. 9. The ame liberal spirit has been shown towards the coast survey by the diectors of the western Morse lines, constructed by Henry O'Reilly, esq. The thorough and cardinal co-operation on the part of the presidents, suerintendents, and operators of the telegraph lines, greatly facilitates the onnexion of the stations in longitude, and bids fair to furnish, in the end, new and important element for the reduction of the work. It is not only he mark of a liberal, but of a patriotic spirit pervading those who have onnexion with these important agents of modern civilization.

The telegraph operations of the coast survey have furnished four indeendent series of observations for difference of longitude between the staons of Washington and Philadelphia, the latter and New York, and etween New York and Cambridge. The facility of obtaining results by ie automatic printing methods, and their superior accuracy, will enable s to add still further to the value of our determinations. The progress of ie art has been so rapid, that it seems now almost perfect; and yet no oubt the appliances will be much improved as experience develops the ninor defects, and ingenuity suggests the remedies. The present condion of the telegraphic lines themselves is such, that the difficulties inrease very much with the length of the wire, from the difference of ıeteorological circumstances, some part of it being exposed to storms of ıin or showers which break the connexion of the whole. Intermediate ations are thus of advantage, not only in consequence of the information ı regard to the longitude of the places themselves, but as increasing the pportunities for telegraphic communication within a given period of time.

The art of telegraphic operations has now reached a point at which it ecomes necessary to inquire, whether the velocity of the galvanic current susceptible of measurement? An attempt to determine this was made y Assistant S. C. Walker, in January last, the results of which were eemed of sufficient interest to be communicated (under approval of the reasury Department) to the American Philosophical Society, and were rinted in their proceedings. Previous to the introduction of the autoıatic printing method for the registering of the transits of stars, this eleıent was insensible.

4. *Triangulation.*—The main and secondary triangulation of the Chesaɜake has been carried by Assistant Edmund Blunt south beyond the ıouth of the Rappahannock river. (See sketch C.) The area included ı the season's work, up to October 7th, is 374 square miles; the number f main stations occupied 8; and of secondary stations 10. The angles ere measured with the 12-inch repeating theodolite, by Simms, (C. S. o. 11,) and with a 10-inch theodolite, by Gambey, (C. S. No. 23,) with telescope adapted to measuring horizontal angles, substituted in the oast Survey office for the telescope of lower power originally furnished ith the instrument. From the 24th of August to the close of October, Ir. Blunt was assisted by Sub-Assistant S. A. Gilbert. This party has

had the use of a small schooner hired by the coast survey during th season.

Mr. Blunt, alluding to observations made from high tripods of timbe in his report, says: "The high station gave very good results, and, a though the instrument was 45 feet above the soil, the observations we perfectly satisfactory. Indeed, I feel warranted in saying that I can rend the tripods so firm, that nothing less than a very *strong* wind will preve my observing when the weather is clear."

One of the sides of the triangulation exceeds twenty miles in lengt Subsequent to the work of this party, stated in my last report, there w executed the following: 18 stations were occupied, 115 observed on, an 2,480 observations made. An additional area of 150 square miles w completed after the report of Mr. Blunt in October of this year.

5. The *secondary triangulation*, on the outer coast of the peninsula the eastern shore of Maryland and Virginia, has been continued southwa by Assistant John Farley, and has reached the light-house on Assateag island, (Virginia.) The area embraced in the season's work to October 81 square miles; the number of stations occupied 8; the number of angl observed 23; and observations made 324. Mr. Farley took the field May, and, with an interval of absence in August, was at work until D cember. The party has suffered from sickness during the season. the present rate of progress, this outer triangulation may be completed from two to three years. Mr. Farley was engaged during the winter in computing and putting in duplicate the records of the last season.

Between the date of my last report and that of closing his work for t season in December, Mr. Farley extended the triangulation to the nor ward of Chincoteague island, and made a partial reconnaissance in t direction of Horntown, for connecting the chain of triangles on t outer coast with that of the Chesapeake. The result was not encouragi

The *tertiary triangulation* of the Nanticoke was made by Assistant D. Cutts, from the base furnished by the secondary triangulation, to enna. The scheme of triangulation is shown in sketch C. The pl and execution were both marked by good judgment and skill. The tri gles are of good figures, the sides of suitable lengths, the stations ge rally so arranged as to permit observation at all times of the day, and expense was incurred for cutting lines. The area embraced in the w is about 22 square miles; the number of stations 18; the number of ang measured 50; and the number of observations made in measuring angles 1,212. Additional points were determined for facilitating the of the plane table.

6. *Topography*.—The topography of the shores of the Chesape has been extended by the party under charge of Assistant R. D. Cu generally working three plane tables—that on the Patapsco by Assist J. B. Glück and Geo. D. Wise, and that on the outer shore of the penins by Assistant George D. Wise.

The party of Assistant Cutts commenced work early in May, and u the 2d of October had completed six sheets, (Nos. 33 to 38 inclus sketch C,) and nearly finished a seventh, (No. 32½,) including the sh of Fishing bay, the Nanticoke, Mony bay, the Wicomico, the two A messics, Tangier sound, and Hooper's straits. The area embraced is square miles, with extent of shore-line of 418 miles.

Of the organization of his party, in which the plan of working more than one plane table has been gradually extended, Mr. Cutts remarks:

“ My party this season has consisted of three aids and eleven hands. Of the aids, one only was acquainted with surveying, the other two being sent for the purpose of learning, and with the view of becoming useful at as early a period as possible. Although both have done well, still I cannot be considered as having had three full plane-table parties in operation for more than a part of the season. Of the comparative advantages of single, double, and triple parties, I can with confidence say, that uniormity and fidelity in the results and economy of expenditure are both subserved by a union of two or more parties, modified in their arrangement by the character of the country to be surveyed. If the country is open, with but few details, two parties only can be employed with advantage on the same sheet; while the third, as has been the case this season, may be detached to a different point, stopping for the time being at the houses most convenient to the work. In the cases of rivers, however, not yet riangulated, the union of three parties will tell to the best advantage. The triangulation can be readily executed by one party, while the other wo follow with the topography of the shores, each charged with his paricular side of the river. This course has been successfully pursued on he Nanticoke—the triangulating party keeping always ahead, and proiding in full time for the continuous operations of the plane tables. On he Patuxent, Potomac, Rappahannock, or any other river where the ountry is rolling and full of detail, requiring more time for its faithful epresentation, the triangulation could not only be in advance, but the ssistant in charge would be able at times to aid materially in forwarding he topography.

“The advantages resulting from a double or triple party are uniformity n the system of surveying and style of drawing, the complete and perect junctions of the different sheets, and the saving of expense.

“ In reference to expense, I may state that on the Chesapeake bay the vers, smaller bays, and creeks are so numerous, and in such close icinity to each other, that, for convenient access to the work, a vessel is most indispensably necessary. Even on the score of economy, a camp, ith its cost of tents, frequent transportation of men and equipage, and oss of time in moving, may be considered a fair offset to the hire of a chooner, fitted out for surveying purposes. Another consideration is he health of the party. Experience has proved that those who live altoether upon the salt water are comparatively exempt from the fevers that, uring certain seasons of the year, prevail on both the western and astern shores of the Chesapeake. Indeed, I venture to say that no arty could encamp on the low and unhealthy lands bordering on the ater without having its operations delayed, if not entirely suspended, uring the summer or fall. For these considerations, if for no others, a essel is necessary for every party working on the Chesapeake.

“ In placing two or more parties on board the same schooner, the aving of expense is evident at the first glance. The double or triple utfit and transportation, however, are not the only saving effected. ewer hands are required. The character of plane-table operations is uch, that while at one time five men may be needed by the assistant to roceed with his work, at other times two or three only are needed—his ants in this respect depending in a measure upon the general features and peculiarities of the country he has to survey. By a judicious arrangement of the work, one party or the other may be thus alternately employed, both not requiring at the same time the full complement of men. In a double party two hands may be spared, and four or five in a triple party; that is, supposing a full party to consist of an assistant and six men."

One of the plane tables of this party has been used by Mr. Cutts himself, who has also made the tertiary triangulation of the Nanticoke, as before stated—one by Mr. John Seib, and one during part of the season by J. M. Wampler, esq., who was transferred in June to the party of Assistant H. L. Whiting, and afterwards by Samuel Wainwright, esq. Th party had the use of a vessel during a greater part of the season—first o the schooner Meredith, then of the schooner Wave.

Since the date of Mr. Cutts's first report, the topography of the coas of Virginia has been commenced on both sides of the bay, the principa work being on the south shore of the Potomac, (sheets Nos. 31 and 31½ sketch C.) This work covers an area of twenty-five square miles, with shore line of seventy-five miles in extent.

The party of Assistant George D. Wise was engaged from the 1st o May until the close of June in work of verification in the Patapsco, and i determining the positions of buoys for the hydrographic party ther Early in July Mr. Wise proceeded to the outer shore of the peninsula o the eastern shore, and between that period and his return to the Patapsc in October, nearly completed the shore line and interior topography o the immediate coast from the salt works below Indian river to Gree river inlet—twenty-six miles of seacoast. The total shore line w eighty-eight miles, and area surveyed thirty-four square miles.

The work of verification on the Patapsco has been carried by Assista J. B. Glück over the site of the city of Baltimore and its environs, and o the southern shore as far down as Curtis's or Marly creek. Mr. Glü also furnished to the hydrographic party the positions of buoys and c tain ranges required for sailing directions, preparing by Lieutenant Commanding S. P. Lee. This party left the Patapsco for section I on t 12th of July, and will return to it at the close of October.

7. *Hydrography.*—The hydrographic work directed on this section consisted of—

1. "The continuation of the hydrography of the Chesapeake south the line Point-no-Point—Hilly Hammock, to which it was completed l season.
2. "The continuation of the in and off-shore work on the outer co of Maryland and Virginia, south from the Isle of Wight shoal.
3. "The revisal of the sailing directions for the Chesapeake general and, as of immediate necessity, those for the Patapsco river."

The steamer Legaré and brig Washington were assigned to the wo the former under command of Lieutenant Commanding S. P. Lee, Uni States navy, assistant in the coast survey, and the latter of Lieuten Commanding Richard Wainwright, United States navy. The hyc graphic party was under the command of Lieutenant Commanding S. Lee, who was also authorized to employ a tender for the off-shore wc The Legaré, which had proved an economical and tolerably effici steamer the previous season, probably from recent thorough repairs, be early to show great weakness in the machinery, the condenser, the eller, and the coupling of the propeller, all becoming more or less dis-rdered or giving way entirely. The full efficiency of the party was herefore not realized, though it will be seen that no inconsiderable share f work has been done. The economy of the vessel while in tolerable vorking order is shown by the table given in the appendix No. 9, which s encouraging in its promises of what might be accomplished if we had the neans to procure an efficient vessel thoroughly adapted to the operations.

The party commenced work before the middle of May, and at the date f Lieutenant Commanding Lee's report, (October 10th,) had completed he hydrography shown in sketch C outside, from the parallel of Beach Iouse station to nearly that of North Birch, Sinepuxent bay, covering an rea of 98 square miles. The extent of the lines of soundings was 275 iles, the number of soundings was 15,000, and the number of angles o determine the positions, measured with a small theodolite from a tripod n shore, 645.

The work in the bay extends from the line Point-no-Point—Bloods-vorth, (see sketch C)—to Smith's Point, (in Virginia,) Shanks's station on mith's island, including the mouth of the Potomac. The area closely ounded out is 260 square miles, the lines of soundings run in boats mea-ured 340 miles, and in the steamer 450 miles. Casts of the lead on the nes run by the boats, 38,000; on those by the steamer, 20,000. Num-er of hydrographical points determined by the sextant, 2,400.

Tidal observations were made (temporarily) at three stations, and ob-ervations of currents at four. The current outside was found to be ifficult to observe, the wind influencing chiefly the direction of the sur-ice water. Bottles were thrown from the vessel frequently, and the par-es observing angles on shore were directed to be watchful in regard o them. Two only were found, which were thrown over on the 1st of ugust in latitude 38° 18′ north, and longitude 75° west, and were icked up on the 5th of August, about a mile north of the light-house n Assateague, southwest from the point at which they were thrown from ie vessel, distant 26 miles. The wind and sea were from the northward nd eastward. It does not appear certain that the bottles were found as oon as washed ashore. The survey is indebted to Archibald Reid, esq., f Horntown, Virginia, and to Samuel Bowden, esq., of Assateague, for ie notice of the finding of the memoranda.

At the commencement of the season and its close, Lieutenant Com-anding Lee was engaged in revising the sailing directions of the Pa-psco river, and in preparing sailing directions for different sections of the hesapeake bay.

Lieutenant Commanding Lee recommends that the "Sheepshead oal" in Point Lookout harbor, Chesapeake bay, should be duly marked y buoys.

This party was occupied during the past winter in plotting the work of ie previous season, in copying the sounding and angle books, and in rranging and labelling the specimens of the bottom.

Useful data have been collected in the performance of the Legaré last ear and during the present, when in running order. The tables fur-ished in 1848 by Lieutenant Commanding Richard Bache, and in 1849 y Lieutenant Commanding S. P. Lee, are given in appendix No. 10. rom these it appears that a mile of in-shore sounding off the coast of ong Island was run by the steam vessel at a cost of 52½ cents for fuel,

&c., and one off the coast of Maryland for 47½ cents; that a mile of off-shore sounding in this vessel cost in 1848, 26½ cents; and a mile of movement during soundings for temperature in the gulf stream, 22½ cents. The average cost for the use of steam for a day, was $14 27.

Sections II, III, IV, and V.

1. *Hydrography.*—The steamer Jefferson, which was converted into a side-wheel steamer during the last winter and spring, was turned over to the coast survey early in July, and placed in charge of Lieutenant Commanding Jenkins, United States navy, with instructions to execute th following work in sections II, III, IV, and V:

1. To run the profile lines for the off-shore chart from Little Egg Harbor, the entrance to New York harbor, and near the middle of the south side of Long Island, perpendicular to the curves of equal depth, and extending to at least one hundred and twenty fathoms in depth.

2. To explore the Gulf stream on the standard section of compariso from the capes of Virginia, and on the section from about Cape Fear, running over a part of the section near the Hatteras shoals, which was no considered by his predecessor as sufficiently examined.

3. To survey Hatteras shoals and the neighboring coast.

4. In case of the impracticability of other sounding work, to run certai specified off-shore lines in the general direction of the coast and betwee the capes of the Delaware and Hatteras.

I expected that in running the profile lines mentioned in 1, an slight deficiency in the working of the engines and in the vessel woul be developed, and near a convenient port for making repairs. The def ciencies were, however, of a grave character, and after supplying them a well as time permitted, Lieutenant Commanding Jenkins concluded confine his attention to the profile lines off New York, and to the lines off-shore soundings marked in sketch C, No. 2, from the capes of the Del ware to south of the capes of the Chesapeake. The first line is abo fifteen miles from the coast, and the depth on it varies from 6 fathoms 19 fathoms; the second about forty miles, with depths of 15 fathoms to 31 fathoms; and the third about sixty-five miles, with depths of 32 fathoms 270 (no bottom.) The whole length of the lines run, including a profi line off Cape Henry, is about 500 miles, on which 81 soundings were take

The repairs and alterations required by the engines rendered necessa the laying up of the vessel in October. It would be good economy to provi the coast survey, by a special appropriation, with substantial steam-vess suited to the rough work off shore, since the advantages of the use of stea have been so clearly demonstrated under all the disadvantages of vess condemned in another service before they were applied to this.

SECTION IV.—FROM CAPE HENRY TO CAPE FEAR, INCLUDING PART OF T COAST OF VIRGINIA AND THE COAST OF NORTH CAROLINA.—(Sketch D.

The survey has been in full activity in this section, and has made all t progress which the unusually inclement and unfavorable character of t season permitted. (See sketch D.) A base line has been measured, t main and secondary triangulation of Croatan, Roanoke, and Curritu sounds has been in progress; the tertiary triangulation of the outer co from Nag's Head south to Hatteras has been made; the topography of t shores of the Alligator and Yeopim rivers, and of part of Croatan, Roanol and Currituck sounds, has been in progress; the hydrography of the upp

art of Albemarle sound and of the entrance to Alligator river has been com-
eted; a hydrographic reconnaissance has been made of the new harbor of
fuge formed at Cape Hatteras and at Hatteras inlet, both on the outer
ast, and a general reconnaissance of all the inlets from Nag's Head south
Ocracoke has been made. It was expected that the sounding of Hatteras
oals would have been commenced, but the failure of the steamer Jeffer-
n to answer the just expectations formed in regard to her performance
evented the execution of the instructions given in regard to this part of
e work. Should means be furnished for suitably repairing the engines
d boilers of this steamer, the work will at once be prosecuted. The
gion is one which requires the use of steam in its survey, and of a ves-
l of sufficient steam-power to make head against the storms which can-
ot fail to be encountered. A more precise account of the progress is
ven under the head of each of the operations, and by reference to the
etches.

The importance of the developments near Hatteras, made this season,
nnot be overrated, nor can too much vigilance be used in determining
hether the important harbors of refuge, Hatteras cove and Hatteras inlet,
e to continue, from natural causes, to afford on this exposed part of our
ast the security to navigators which they now furnish.

The examination of the inlet of 1846 (Oregon inlet) across Bodie's
land, (see sketch D,) has been continued from time to time, but on no
casion has more than four feet been found in the channel across the
bulkhead," at the entrance into Pamlico sound. Assistant W. M.
oyce, who examined it in January, 1849, found 7½ feet on the bar out-
de, and 4 feet on the bulkhead, between the channel of the inlet and
e "old house channel" into the sound. I give an extract from this
tter in the appendix No. 11, containing interesting remarks upon the
let and its approaches.

Lieutenant Commanding Alden, in July, 1849, reported that after a
reful reconnaissance of Oregon and New inlets, he was satisfied that the
rmer could not be approached from the sound nearer than a mile and a
lf by a vessel drawing four feet and a half of water, and the latter not
ore than some five or six miles, the entrance to both from the ocean
ing intricate and obstructed by shoals.

The thanks of the survey are due to J. W. Page, esq., of Merry Hill,
ertie county, North Carolina, for forwarding to me a slip found
a bottle on the coast near Nag's Head, and which had been thrown
er from the coast survey steamer Jefferson in latitude 37° 48′ 42″
orth, and longitude 72° 36′ 20″ west, on the 10th of September.
r. Page states that it was probable that the bottle was found soon
ter being driven on shore. It was thrown from the vessel at noon
the 10th September, nearer the coast than the inner edge of the
ulf stream (north of Cape Charles, and south of Henlopen,) and was
und at noon on the 22d at Nag's Head, about 210 miles southwest by
est from its point of departure. The wind in the interval at Nag's Head
d been almost invariably from the northeast and eastward. Mr. Page's
tter is given in the appendix No. 12. It is to be regretted that so few
these useful indicators of currents are heard from, out of the number
hich are thrown over.

1. *Measurement of base.*—As stated in my last report, the measurement
the base, six and three-quarter miles in length, was commenced in
ovember.

The base was alligned and approximately measured by Assistant C. O. Boutelle. The allignment was made by a Gambey theodolite, or by sectors made by Temple, pegs being driven and copper nails placed in them to mark the line. At every 400 metres a large peg was driven, and alligned with much care, so as to be used in determining the line in measuring, a tripod, with a heavy iron plumb-bob suspended by a cord, being placed over these marks.

The base was measured by the compensating apparatus planned by me, and executed in the office of the survey by Mr. Würdeman. Its peculiarities have been described in a former report. Its length was invariable at different temperatures, and through changes of temperature. The apparatus was compared in length with the standard iron bar before the measurement was commenced, when near the middle of the base, and afte closing the measurement. Two hundred and sixty-one observations were made on six different days for this purpose at temperatures varying from 67°.2 to 33°.9, a portion of them being as near 32° as could be obtained. The measures were very accordant in their results. In making these observations, the apparatus was placed between two stone posts, plumbed in wooden boxes without top or bottom, which were sunk in the sand to the depth of nearly three feet; the knife edge at one end pressing agains the plane end of a short cylinder, and the agate plane at the other agains a point turning a mirror, as in Mr. Saxton's pyrometer. The reading telescope and scale were attached to a post opposite that last referred to The steadiness of the posts was quite unexpected, the results being superior to those obtained previously in the office.

The measurement was commenced on the 4th and completed on the 23d November, the weather having been moderately favorable in the interval. Ten days were employed in the actual measurement.

At the end of each day's work, three heavy pieces of timber or block of stone were placed under the ends of the tubes, and marks made o them corresponding to as many measures, the marks being made by th assistance of the sectors, or of a six-inch Gambey theodolite. At the end of the tubes nearest to the several miles, stone posts were sunk, with copper bolts inserted and duly marked. The measurement was begun a the north end of the base, and both extremities were secured by granit posts resting upon a stone foundation, and this upon a platform of timber below the surface of the water, which is generally found here at les than three feet distance below the ground. The actual extremity is marke by a copper nail in a cedar stake driven in the axis of an earthenwar frustrum of a cone, and corresponding to which is a hole in the platform In the heavy stones forming the foundation, a copper bolt marks th same point. The prolongations of the base, and a perpendicular to th ends, have been marked by posts with copper bolts, and pains have bee taken to secure the monuments at the terminations.

The facility of measurement on this site, from its level character, wa very great, and if it is not secure from the invasions of the ocean sound, it is at least as secure as any level part of this coast. A few par of the line, where grading was required through low sand hills or in ho lows, had been prepared previous to commencing the measurement, were graded at intervals during its progress.

The trestles supporting the tubes of the base apparatus were place upon iron plates resting upon the surface of the sand.

The least distance measured in any one day was 528 meters in $5\frac{1}{4}$ hours, and the greatest was 1,692 meters (1.06 mile) in $8\frac{1}{2}$ hours. In the work generally I was assisted by Assistant C. O. Boutelle, who directed the forward tube; in making the contacts in measuring, by Sub-Assistant J. Hewston, jr. The allignment was preserved by Sub-Assistant Joseph Ruth. The trestles were set by T. McDonnell, esq. The records were made by Mr. B. H. Duncan. In preparing the apparatus for comparison of lengths with the standard bar, and in making such incidental repairs as were required, Mr. J. Clark, of the office of weights and measures, rendered valuable service.

After the measurement was made, we repeated part of it on a portion of the line, which admitted of stakes being permanently placed below the extremity of each second tube, for comparison. The length of twenty-two tubes was then remeasured four times, making in all about one-third of a mile. The probable error thus found for the whole length of the base, (1,807 tubes,) or nearly $6\frac{3}{4}$ miles, was less than one-tenth of an inch. On the hypothesis in regard to these repetitions most unfavorable to the accuracy of the measurement, the error for the whole length was less than three-tenths of an inch. The circumstances being somewhat unfavorable to the first day's measurement, it was repeated, and the second measurement of 88 tubes (about one-third of a mile) differed less than 1-200th part of an inch from the first.

2. *Triangulation.*—Three triangulation parties have been employed during parts of the year in this section: the main triangulation and secondary connected with it, under the charge of Assistant W. M. Boyce, a tertiary triangulation and topographical work connected with it, under the charge of Assistant A. W. Longfellow during part of the season, and a tertiary triangulation also during part of the season, by Sub-Assistant John Hewston, jr.

The party of Assistant W. M. Boyce took the field in December and closed their work early in July, continuing the triangulation of Croatan, Roanoke, and Currituck sounds, (see sketch D.) The area included in the season's work is 220 square miles. Number of stations occupied 18, including 14 main and 4 secondary. Number of points observed upon, 115. Number of observations, made with a ten-inch repeating theodolite by Gambey, (C. S. No. 15,) 7,086. At all the stations, except three, artificial elevations were used, the instrument being raised from 8 to 30 feet above the ground.

The season has been very unfavorable for this work—the most unfavorable, decidedly, since its commencement. In reference to it, Mr. Boyce remarks: "The weather during the whole season, as shown by the monthly reports, was unusually bad, not having many more than one-half the number of days suitable for observing had last year." The party suffered much from the unusual inclemency of the weather, and Mr. Boyce has been so ill from the effects of exposure to the climate, that an early resumption of his work this autumn is absolutely impossible. Such measures as the case admits will be taken to supply, as far as possible, the personal services of Mr. Boyce, by work under his direction.

A tertiary triangulation, resting on the points marked on the Bodie's island base, was carried, by Assistant A. W. Longfellow, over the island, furnishing points for the topographical survey, which he subsequently executed. It also furnished shore-line for the hydrographic reconnaissance of the inlet of 1846, which at one time promised to become of importance as an entrance to Pamlico and Roanoke sounds. The early period at which the illness of Mr. Longfellow made his withdrawal from this section necessary, prevented his prosecuting the triangulation towards Cape Hatteras further than about two miles south of the inlet of 1846, including the new light-house on its southern limit. Fourteen stations were occupied and observations made upon 26 points, eighty-nine angles being determined by 617 repetitions with a six-inch theodolite by Gambey, (No. 12 C. S.)

The difficulty of communicating with parties in this region, and other circumstances preventing my arrangements for prosecuting this important part of the work from taking effect, Sub-Assistant J. Hewston, jr., was sent to the section in July, with instructions to carry the tertiary triangulation south to Hatteras inlet, and to establish signals for the hydrographic party of Lieutenant Commanding Jenkins, which it was expected would be able to work off Hatteras in the steamer Jefferson. The progress of the tertiary triangulation is shown upon sketch D. The scheme was controlled by the difficulties of the case; and, when suitably-shaped triangles were not practicable, a double series was carried on, giving quadrilaterals with both diagonals determined. The primary triangulation of Pamlico sound will check this work, which, in the mean time, furnishes approximate data for the hydrography. Great credit is due to Mr. Hewston for undertaking this survey at a season when the parties generally were withdrawn from the section, and to supply determinations which it was expected would have been furnished in the regular progress of the work, and would be needed for the use of the hydrographic party outside. By means of it, we shall be able at an early day to replace the hydrographic reconnaissance of Hatteras cove and Hatteras inlet by regular surveys. Up to December 1, 28 stations had been occupied, and 112 angles measured, covering an area of 39 square miles.

3. *Topography.*—The topography has embraced the shore of part of Albemarle, Croatan, Roanoke, and Currituck sounds, of Bodie's island, from Nag's Head to the new light-house near the inlet of 1846, (see sketch D,) of the Alligator and part of the Yeopim rivers. The party of Assistant J. J. S. Hassler has been exclusively employed, and that of Assistant A. W. Longfellow in part employed, in the execution of the work.

The limits of Mr. Hassler's work are shown on the sheets upon sketch D, besides which some topographical work on Yeopim river was executed by him. The party took the field in December and left it in July, having during that time 120 working days, 50 days in which work was prevented by rain, fog, or wind; 39 by moving, clearing ways through the tall reeds and bushes, for lines, and the like—making a total of 209 days. The area surveyed is 56 square miles; the extent of shore-line 123 miles. Before taking the field, and since leaving it, Mr. Hassler has been engaged in putting in ink the details of the topographical sheets of the previous and of last year.

The topography executed by Assistant A. W. Longfellow is included in the sheets on the Alligator river, sketch D. The party was in the field from December until May, when the illness of Mr. Longfellow stopped the operations. The party had the use of the schooner Vanderbilt during the season. The area gone over is about 36 square miles, the extent of shore line 143 miles ; the large proportion of shore line to area is explained by the character of the country. "The shores of Alligator river are, with scarcely an exception, a densely wooded swamp." "Some parts of it are covered with reeds, but generally the shore line is defined by a luxuriant growth of black gum, laurel, pine, cypress, juniper, &c., interlaced with briars and vines, forming an impenetrable jungle." Mr. Longfellow was assisted by A. S. Wadsworth, jr., upon whom, in consequence of Mr. Longfellow's sickness, devolved a part of the work, which was executed "in a very creditable manner." One sheet includes Rockhall creek, which, according to Mr. Longfellow, tradition assigns as the locality of Roanoke inlet, (now obliterated,) through which the vessels of the first expedition to North Carolina passed into Albemarle sound.

4. *Hydrography.*—The hydrography of this section has been in charge of several different officers. Lieutenant Commanding W. P. McArthur closed his work in December, preparatory to taking charge of the hydrography n the Oregon section of the coast. The unfinished work between Bluff point, Pear Tree point, Mill point, and Laurel point, in the Albemarle sound (see sketch D,) was completed and plotted, and the notes in duplicate deposited in the office.

The hydrography was continued westward to the limits of the triangulation by Lieutenant Commanding Thornton A. Jenkins, when the season opened in the spring. Between the 7th of May and the 9th of June, hydrographic sheets Nos. 2 and 3 (sketch D) were completed, including he Scuppernong and Yeopim rivers, and the Albemarle sound between Harvey's mill, Edenton Court-house, East Chowan, Black Walnut Point, Cape Heart, and Williams's Signal. The area included was 115 square miles. 29,914 soundings were taken on 401 lines, and the positions were determined by 505 measured angles.

Lieutenant Commanding James Alden, United States navy, assistant in he coast survey, prosecuted the work in Albemarle sound near the entrance to the Alligator river, (see sketch D,) and made a hydrographic reconnaissance of the inlet of 1846, and of the important inlet into Pamlico sound near Cape Hatteras. 9,898 soundings were taken in the different parts of this work. The party ceased operations in July, to return n November.

Lieutenant Commanding Alden made a reconnaissance of the different nlets on the coast of North Carolina from the inlet of 1846 to Hatteras inlet, and reports that he found but one at all fit for purposes of navigation as an entrance from the sea—namely, Hatteras inlet—and that having a "bulkhead" in Pamlico sound across the channel with six feet of water on it, and a tortuous channel on the sound side. As a harbor of refuge this inlet is, however, of the greatest value. Attention was first drawn to it by a eport from Lieutenant Commanding Maffitt, and the examination which ollowed by Lieutenant Commanding Alden confirmed the conclusions in egard to its importance as a harbor of refuge from seaward. Lieutenant Alden's report contains the following statements :

"This opening bears from Hatteras light south 70 degrees west, distant about 12 miles. It will be easily recognised by the remarkable round hammock, covered with trees, on the east side of the entrance. The least depth t low water on the bar is 14 feet. It should be approached from the northward and eastward; and as the breakers seldom extend across the entrance, it an be readily discovered by the smoothness of the water between them. At that point steer northwest by west, keeping along the breakers on the starboard hand until well in, then haul more to the northward, and anchor soon after inside the sand-spits which form the entrance, and which, together with the bar outside, afford sufficient protection against all winds from that quarter. The best anchorage for a vessel drawing 10 feet of water is where the schooner's first position is marked on the chart, and where the current will be felt much less than in mid-channel; the currents and tides are influenced very much by the winds. The greatest velocity we found was three knots, between the two sand-spits. The mean rise and fall was 2.2 feet.

"There are two openings: the one to the westward is small, and has a very narrow and intricate channel, and must be considered of little or no importance while so near a much finer and better one.

"Good pilots can be obtained for Hatteras inlet at any time."

The report of Lieutenant Alden was printed and the sketch engraved at the office of the survey, and circulated as widely as possible among navigators and underwriters. The sketch, with sailing directions for entering the harbor of refuge, is appended to this report, (sketch D, No. 4.)

A hydrographic reconnaissance of a harbor of refuge just south of Cape Hatteras, which has been formed within the last few years, was made by Lieutenant Commanding Maffitt.

According to his report, Hatteras cove lies to the northward and westward of the extreme point of Cape Hatteras; is sheltered from the northeast, and affords good anchorage in four to five fathoms water, with a bottom of "soft blue mud." From the anchorage Hatteras light bears NNE., distant about one mile and a half. Since 1845 the southwest spit of Hatteras has made out nearly three-eighths of a mile.

The sketch prepared by Lieutenant Commanding Maffitt, with sailing directions, was at once engraved and distributed. It is now appended to this report, (sketch D, No. 3.)

SECTION V.—FROM CAPE FEAR TO THE ST. MARY'S RIVER, INCLUDING THE COAST OF THE STATES OF SOUTH CAROLINA AND GEORGIA.—(Sketch E.)

The work in this section has made proportionately greater progress than was anticipated at the date of my last report. The minute reconnaissance for the main triangulation has been continued; the geographical position of a point in the triangulation determined; the secondary triangulation o Charleston harbor and its vicinity, and the topography, have been completed, and the hydrography of the approaches to the harbor has been nearly completed. Four parties, respectively under Assistant Boutelle Sub-Assistants Gilbert and Bolles, and Lieutenant Commanding Maffitt have been employed during the last spring in advancing the work in thi section. I propose to measure the base on Edisto island as soon as the beginning of winter permits, and the same reconnaissance, triangulation and hydrographic parties are under instructions to recommence their work as early as practicable. The measurement of a preliminary base and th astronomical observations of the same class, made near Charleston, enabled us to anticipate, in the survey of Charleston harbor, the regular progress of operations by more than a year. The map of this harbor is now reducing, so that as soon as the hydrography is completed and reduced, the whole may be placed in the hands of the engraver.

A copy of the map of the city of Charleston, by Sub-Assistant S. A. Gilbert, has been asked for by the citizens, and has been communicated by authority of the Secretary of the Treasury. In April last I visited the parties in this section, and was much gratified by the progress which they had made in the work, which exceeded my expectations. Arrangements have been made with the southern telegraph company, through the liberality of the president, the Hon. Elam Alexander, to use the line for connecting Washington and Charleston as soon as the season is favorable. During the summer, even when the meteorological circumstances at the ends of the line are favorable, a summer shower or thunder gust may prevent communication between the astronomers. The winter season is decidedly more favorable to successful operations for difference of longitude.

1. *Reconnaissance.*—The minute reconnaissance for the main triangulation on the coast, and its connexion with that of Charleston harbor, has been continued during the past season by Sub-Assistant C. P. Bolles, who aided Assistant J. S. Williams in the preliminary reconnaissance. The party took the field in November, and continued there until June. Their operations were under the general direction of Mr. Williams, until his departure for Oregon in January last. The lines New Cut to Elliott's, (see sketch E,) Matthews' to Elliott's, Matthews' to Vincent's, Matthews' to Breach Inlet, Elliott's to Vincent's, Elliott's to Breach Inlet, and Elliott's to Wando, have been traced. Mr. Bolles has twice during the season suffered from illness, and from the latter end of April until early in June the party was under the charge of his aid, Mr. J. W. Gregorie.

After assisting in the measurement of the Edisto base, Mr. Bolles will continue the reconnaissance for a secondary triangulation across St. Helena sound, and will proceed with the work towards the mouth of the Savannah river.

2. *Measurement of base.*—The site for a base line on Edisto island, selected by Assistant James S. Williams, was examined by me, accompanied by Assistant C. O. Boutelle, in April last. The character of the site differs essentially from those of the other bases of the coast survey, being, however, very level, and the chief obstacles such as arise from the high cultivation of the ground over which the line passes. It has the great advantages of an unexposed position, and of the permanence of the marks at the extremities. As early as the season permitted, the preliminary arrangements for measuring were begun, under my immediate direction, by Assistant C. O. Boutelle, and will, it is expected, be completed so as to commence the measurement by the close of December, or early in January.

3. *Astronomical and magnetic observations.*—The latitude of the station at Breach inlet (see sketch E,) and the azimuths of the sides of the triangles intersecting at that point, for the survey of Charleston harbor, have been determined by Assistant C. O. Boutelle. "The observations for time and latitude were commenced on the 26th of March. A succession of fine nights ensued, and I was able to complete the observations for latitude in less time than usual: 559 observations on 28 pairs of stars were made for latitude on 16 nights; 88 transits for time were observed on 23 nights. The instruments used were zenith telescope No. 1 of the coast survey,

and C. S. transit No. 4, a new and excellent instrument by Simms, having 47 inches focal length, and $2\frac{3}{4}$ inches aperture." At the close of the observations for latitude, a series of observations on Polaris, at its elongation, were made for the value of the micrometer screw of the zenith telescope; 114 observations were made on four elongations.

Magnetic observations for declination, intensity, and dip, were made with declinometer D 22, and a dip circle by Barrow (C. S. No. 1.) The observed variation at Breach inlet for last April will be very near 2° 20′ east of north. 293 half-hourly readings were made, and sets of maxima and minima obtained on 14 days. Experiments of deflexion and vibration were made on two days—48 observations of deflexion and 56 of vibration. 96 observations were made for dip.

The observations for azimuth were made with the two-feet theodolite of the coast survey, and the usual method of observation of the east and west elongations of Polaris followed. Number of observations for azimuth on star and mark, 242; number of angles observed to connect the azimuth with the primary and secondary triangulation, 12, on 11 objects by 108 observations.

Meteorological observations were kept up during the stay of the party at Breach inlet. The barometers used were a Prussian cistern barometer, and an aneroid, kindly loaned by Mr. Mathiessen, of Charleston. Mr. Boutelle was assisted in all the observations at Breach inlet by Sub-Assistant John Hewston, jr., and by Mr. George W. Dean.

The party remained in this section until the close of April, and was then transferred to section No. 1. The computations of this work were revised by Mr. Boutelle and Sub-Assistant C. P. Bolles, in May and part of June.

The observations of moon culminations with the five-feet transit of the coast survey, (No. 2 C. S.) have been continued by Professor Gibbes.

4. *Triangulation.*—The triangulation of Charleston harbor and its vicinity was commenced by Assistant C. O. Boutelle on the 12th of January, and completed on the 17th of March; 13 stations were occupied, and 164 angles measured upon 143 objects, by 1,776 observations with a six-inch Gambey theodolite (C. S. No. 13.) Mr. Boutelle was assisted in the triangulation by Sub-Assistant S. A. Gilbert.

This work rests upon a base of about a mile and a quarter in length, carefully measured with wooden rods upon the Meeting street road, Charleston neck. The scheme of triangulation and its connexion with the preliminary base, as also with the principal base on Edisto island, are shown in sketch E. The computations of this work were made by Mr. G. W. Fairfield, under the immediate direction of Mr. Boutelle, while he was in the field in section I of the survey. He is now under instructions to proceed with the main and secondary triangulations, and the astronomical observations connected with them. Mr. Boutelle remarks, "I cannot close this account of my five months' sojourn in and near Charleston without again expressing my deep sense of obligation for the many acts of kindness, both official and personal, which I received from its citizens. Much interest was manifested in our work, as was evinced in one instance by the resolutions of the Chamber of Commerce, and the appointment of a committee of their body to afford us such aid as we had occasion to ask for. To the chairman of that committee, Henry Gourdin, esq., we were indebted for much kind attention and civility. I am also indebted to Captain A. H. Bow-man, United States corps of engineers, for the loan of instruments and articles for the use of the Wave, and for stone blocks for the astronomical instruments, and to Colonel Erving, commander at Fort Moultrie, and Lieutenant Weld, acting quartermaster, for the loan of teams, and for storage of our camp equipage."

5. *Topography.*—The topography of the shores of Charleston harbor and its entrance from the sea, and the plan of the city and wharves, have been executed by Sub-Assistant S. A. Gilbert. Sheet No. 1 (sketch E) includes Morris island, part of James island, and the city; No. 2 embraces Sullivan's island, Shute's Folly, Drum or Lamprey and Hog islands, and part of Daniel's island, at the junction of the Cooper and Wando rivers. The sheet marked with a broken line includes part of Folly island, of which the shore line was determined for the use of the hydrographical party. The area surveyed is thirty-five and a half square miles, the extent of shore line one hundred and forty-one and a half miles, and the length of the streets and wharves forty-eight and a half miles. The party commenced work on the 19th of March, and closed it on the 15th of July. The plane-table sheets were put in ink by Mr. Gilbert, aided by Mr. J. W. Gregorie.

During the time above referred to, as included in the season's work, Mr. Gilbert made a preliminary topographical survey of Bull's bay, tracing the shore line of the entrance as far as was necessary for the hydrographic reconnaissance. The survey is included in sketch E, No. 2. Mr. Gilbert's work in sections I and III of the coast survey has already been referred to. He is now under instructions to join Assistant R. H. Fauntleroy in section IX.

6. *Hydrography.*—The hydrography of the approaches to Charleston harbor was commenced as early in the season as the land work furnished data for the soundings. The schooner Morris, transferred from the Quartermaster General's department, United States army, was altered so as to adapt her to hydrographic purposes, under the direction of Lieutenant Commanding J. N. Maffitt, United States navy, assistant in coast survey. The work was commenced by the 1st of May and continued until June, during which time the bar and its approaches were sounded out. The party of Lieutenant Commanding Maffitt is under instructions to return to this section for the completion of the hydrography of the harbor and its approaches. A permanent tide station has been established in the cove of Sullivan's island through the kind assistance of Colonel Erving, United States army, commanding at Fort Moultrie.

Before closing his work in this section, Lieutenant Commanding Maffitt made a hydrographic reconnaissance of Bull's bay, about 23 miles northeast of Charleston—a sketch of which is appended to this report, (sketch E, No. 2.) He recommends the erection of a light-house on the northeast bluff of Bull's island, to facilitate the entrance at night into this valuable harbor of refuge.

The important hydrographic reconnaissance made by Lieutenant Commanding Maffitt of Hatteras cove, and his services during the last winter and the season just closed, have been already referred to in connexion with sections IV and I of the coast.

SECTION VI.—FROM THE ST. MARY'S RIVER TO ST. JOSEPH'S BAY, COAST OF FLORIDA, AND INCLUDING THE FLORIDA REEFS AND KEYS.—(Sketch F.)

No portion of the coast of the United States has stronger claims than this to a speedy and minute survey, whether we regard the dangers to navigation, the amount of commerce which passes by it, or the various localities of the Union interested in the trading vessels. The representations made on this subject from New York have been as strong and as urgent as those from Florida itself, and the lists of wrecks annually presented under authority of the board of underwriters furnishes the best evidence of the necessity of the work. In the year 1848, forty-one vessels hailing from twenty different ports, and valued with their cargoes at $1,282,000, were wrecked upon this coast; the amount of salvage awarded upon them was $125,800, and the total amount of expenses $200,000.—(Appendix No. 14.)

Were the dangers of this coast made known by accurate charts, the direction and force of currents duly examined, the action of tides and character of winds investigated, the positions for light-houses, beacons and buoys suitably determined, and the necessary aids to navigation provided, this loss of property would be much diminished.

In reply to a resolution of the Senate of the United States, the Secretary of the Treasury recommended a special appropriation for the more speedy survey of this part of the coast than could be secured from its proportion of the ordinary appropriation for the survey of the coast of the United States. The amount suggested in my report, transmitted by the Secretary of the Treasury to the Senate, was about sixty thousand dollars per annum. For the discussion of this subject, and the information collected in relation to it, I refer to this report, in Ex. Doc. No. 30, Senate, 30th Congress, 2d session. The amount appropriated for the present fiscal year was thirty thousand dollars, furnishing means for a gradual but not a speedy survey. On a statement to the Treasury Department of the urgency of the case, I was authorized by the present Secretary to proceed at once with the work in anticipation of the fiscal year, and organized two triangulation parties and a hydrographic party to proceed at once to commence the survey. Various circumstances beyond my control, and beyond that of the officers in charge of the parties, prevented the full effect of my plans, but a satisfactory beginning of the work had been already made when the advance of the summer rendered its further prosecution impracticable. The land parties have with increased force resumed their operations at the earliest period of the autumn when they could work with safety. The sketch shows the progress of the work made before the summer rendered it necessary to close operations, and the details are given in the following paragraphs under their appropriate heads.

The first object proposed was to connect the survey already executed by Major Hartman Bache, of the topographical engineers, in and nea Key West harbor, with the coast survey, and to extend the limits of th hydrography; to furnish the basis of the hydrographic reconnaissanc near Key Vacas and the Pine islands, in reference to channels across th reef alleged to exist there, and of Bahia Honda, in reference to its changes While this hydrographic work was doing, to prepare for the regular opera tions of the survey by commencing first at Cape Florida, and passing towards Carysfort reef, and subsequently by a base near Cape Sable, and a connexion with the keys and Florida reef, to push the regular survey both eastward to meet the former, and westward towards Key West, following up the land work closely by the hydrography.

1. *Reconnaissance.*—A general reconnaissance of the Florida keys and reefs, especially with a view to the surveys required by the Land Office, was commenced in December last, by request of the Commissioner of the General Land Office, and under my direction, by Assistant F. H. Gerdes. Mr. Gerdes commenced his reconnaissance with the Marquesas islands; examined the Mangrove islands and keys adjacent; the Boca Chica islands, forty in number, (including Key West;) the Pine islands; Bahia Honda islands; and the keys and islands eastward to Key Rodriguez. (See sketch F.) Next, omitting for the time the ground occupied by the late British surveys as comparatively well determined, he proceeded to the vicinity of Key Biscayne, and extended his work southward and westward across Key Biscayne bay into Card's sound, embracing the keys and the main shore in his operations. The reconnaissance resulted in the scheme shown in sketch F, where the facilities of the application of the geodetic method fully appear. A preliminary base line near Cape Florida, either on Key Biscayne or the main, may be easily measured, and will provide for commencing the triangulation at this exposed and important part of the coast. That this is an important part of the coast to survey, is shown by the analysis of losses by wreck on the Florida keys and reefs made by Assistant F. H. Gerdes from the statements of the agent of the underwriters at Key West. (Appendix No. 15.) The views of Assistant Gerdes were fully sustained by the representations of intelligent citizens of Key West and officers of the government, who have every opportunity of knowing the special wants of this section.

The further reconnaissance is directed towards determining a base on the main, near Cape Sable, readily connected by the intermediate keys with the outer line of keys fringed by the reef, and affording a base for a triangulation extending eastward to meet the work coming from Cape Florida and westward towards Key West. This work would, no doubt, have been completed, but for the dangerous illness of Assistant Gerdes during a visit to Washington, on duty, at the close of his preliminary reconnaissance in April; this illness was of a character which forbade his return to work until this autumn. He has now taken the field for the further prosecution of this work and the measurement of the preliminary base.

While on the coast of Key Biscayne bay, Mr. Gerdes, in accordance with a request from the Secretary of the Treasury, ran a line of levels from the Everglades to the low-water mark on the gulf, following the general direction of the Miami river, from the upper falls to near its entrance into Key Biscayne bay. The general course of the line was ESE., its length 3¾ miles, and the level of the water in the glades was 6 feet 2.5 inches above low tide in the gulf. When the levellings were made, the level of the water in the glades was stated to be lower, and the tide in the gulf higher than ordinary, and Mr. Gerdes, therefore, placed two permanent bench-marks for future reference. No means were at his disposal for ascertaining the depth of water in the Everglades. The average fall per mile thus ascertained by Mr. Gerdes is nineteen inches and eighty-seven hundredths. The *average fall* of the Ohio and Mississippi, from Pittsburg to the sea, is stated at four inches and thirty-four hundredths per mile,

2. *Triangulation.*—The special objects and localities of the triangulation have been already stated. Assistant Julius E. Hilgard commenced this work on the 24th of April, and continued it until the 3d of July. "The work embraces an area of 136 square miles, on which 27 points have been determined. Eight stations were occupied, at which 33 angles were measured by 350 repetitions, and 162 single observations made upon 16 stations with the 12-inch Gambey, and 11 angles measured by 95 repetitions with the 6-inch Gambey. The work in the vicinity of Bahia Honda and Knight's key embraces an area of 129 square miles, on which 20 points are determined. Eight stations were occupied, at which 23 angles were measured by 230 repetitions; and 15 angles by 90 simple measures with the 12-inch Gambey, and 27 angles by 300 repetitions with the 6-inch Gambey. The condition of the atmosphere was generally favorable to observation, but deteriorated very much towards the end of June."

It was expected that the party of Assistant Gerdes would also have been engaged in advancing this portion of the survey, but his illness at Washington broke up this part of my plans; and the very serious nature of that illness and its effects were not known in time to make other arrangements.

3. *Astronomical and magnetic observations.*—One station, (Sand key,) near Key West, was occupied by Assistant J. E. Hilgard, for astronomica and magnetic observations, between the 15th of July and the 22d of August, and his perseverance to a late period of the season, notwithstandin the many discouragements incident to its advance, is deserving of al commendation. The following observations were made:

1. For longitude—22 moon culminations, and 172 transits of moon culminating stars and standard stars for time.

2. For latitude—145 observations on 40 sets of stars with the zenit telescope.

3. For azimuth—15 positions, each containing 16 observations on Polaris, at various hour angles, with the 12-inch Gambey; and in connexio with the same, two horizontal angles by 308 observations.

4. For magnetic declination—3 sets.

5. For magnetic dip—4 sets: 2 with the 12-inch circle, and 2 with th 8-inch, both by Barrow.

6. For horizontal intensity—2 complete sets, including 2 sets for moment of inertia.

4. *Hydrography.*—At the earliest date that means could be procured fo the purpose, from the appropriation made by Congress at the session 1849 for the survey of the Florida reefs and keys, the schooner Petr was despatched for the purpose, under charge of Lieutenant Commandin John Rodgers, United States navy, assistant United States coast survey The party was also directed to make a reconnaissance, in passing, of th entrance to the St. Mary's and St. John's rivers, on the eastern coast Florida. On reaching Charleston, Lieutenant Commanding Rodgers wa detached, as a witness in a court martial holding at Norfolk, and left th vessel under command of Lieutenant Wilmer Shields, United State navy, on coast survey service, with directions, after making the reconnaissance, to meet him at New Orleans, where the sailing vessel was to be exchanged for the steamer Hetzel, transferred from the Quartermaster General's department, United States army, to the coast survey. The Hetz

ras detained so long on her passage by head winds and calms before eaching Key West, that, after the exchange of the vessels at New Orzans, little more could be done than to prepare for an early commencenent of the work near Key West in the autumn. Lieutenant Rodgers ccordingly, after making such preparations, brought the steamer to New York for thorough examination and repairs, and is now under instructions, s soon as the repairs are completed, to resume the survey of the Florida eefs and keys on the basis of the triangulation prepared by the party of Ir. Hilgard. The use of the steamer will advance the work so much nore rapidly than the employment of sailing vessels, that the first few reeks will more than make up for the loss of time by the exchange of essels—it will, in fact, be difficult for the land parties to keep pace with a ydrographic party provided with a good steam vessel; and the amount ppropriated for the work determines, of course, the number of parties hich can be employed.

To complete the reconnaissance a series of tidal observations is necessary, r which arrangements will be made at the earliest date practicable.

SECTION VII.—FROM ST. JOSEPH'S BAY TO MOBILE BAY.—(Sketch G.)

The reconnaissance in this section was nearly completed last winr, and the scheme of triangulation is prepared when the appropriation ermits the commencement of the work. Section VI, in the same tate, (including the Florida reefs and keys,) necessarily claims preceence, from the amount of commerce which passes along its coast and the angers which it presents.

ECTION VIII.—FROM DAUPHIN ISLAND TO VERMILLION BAY, INCLUDING THE COAST OF ALABAMA, MISSISSIPPI, AND PART OF LOUISIANA.—(Sketch H.)

The season has not been favorable in this section to the operations of the irvey generally. The secondary triangulation, the topography and the ydrography of Mobile bay, have, however, been nearly completed, and the pography of the islands limiting Mississippi sound on the south has been uite finished. The hydrography of Cat and Ship island harbors has een completed by observations of currents and sailing directions, and ie chart has been drawn, reduced, and the engraving (which, for reasons onnected with the hydrography, was made to take precedence of the hart of Mobile entrance) is nearly finished. The chart of the entrance Mobile bay is nearly reduced for engraving. At the close of this seaon there will be materials for the general chart of Mobile bay in the office, id the reduction will follow closely the field-work.

The secondary triangulation party is under instructions to proceed to ake Borgne, and another will probably be organized for the work of tringulation from the Chandeleur islands towards the mouth of the Missisppi. Astronomical observations will, if practicable, be made at Cat land. At the close of the fiscal year, which is nearly the close of the eason in this section, the land work will still be considerably in advance f the hydrography. Besides the completion of as much of the hydroraphy of the first coast sheet as practicable, a reconnaissance of the iouths of the Mississippi will be commenced if the season is favorable.

The conclusions of Professor Baily from his examination of the specimens of bottom from Mobile bay and its approaches, have an important bearing on the origin of the deposites forming the bar; they are stated in full under the head of hydrography, in this section.

1. *Triangulation.*—As mentioned in my report of last year, the primary triangulation in this section, and the secondary immediately connected with it, is much in advance of the hydrography, extending from Mobile entrance to the entrance of Lake Borgne, to Cat island, and the Chandeleurs, Louisiana. The services of Assistant F. H. Gerdes have thus been available for reconnaissance in sections VI and VII on the coast of Florida. The reconnaissance in section VII noticed in my report of last year was nearly completed from Mobile bay east to Choctawhatchie, and that of section VI, of which an account will be found under its proper head, was taken up in December last.

The secondary triangulation of the lower part of Pascagoula river, required for the plane-table party, was made by Assistant F. H. Gerdes. Some time, during the summer, was also devoted to securing the station points of the triangulation.

The *secondary* triangulation of Mobile bay, and of the delta of the Mobile, Spanish, Tensaw, and Apalacha rivers, emptying into the head of the bay and immediately above the city of Mobile, and of the arm of the bay called Bonsecours bay, has been continued and nearly completed by Assistant C. M. Eakin, (see sketch H,) and the triangulation has been connected with the main coast work. This party took the field in December and left it in June, closing their operations earlier than the progress of the season would otherwise have required, in consequence of sickness contracted in an attempt to open a line between Bonsecours bay and the gulf. The area surveyed is 192 square miles.

The number of observations made for the measurement of angles was 2,448, the 12-inch theodolite by Patten (C. S. No. 14) being used. The minute reconnaissance of the Mobile delta was made, and signals erected in April.

Mr. Eakin remarks upon the unusually unfavorable and inclement character of the past season, and upon the impediments to his progress from sickness. On resuming work this party will be directed to make the triangulations of Lakes Borgne and Pontchartrain towards New Orleans. The office-work of Assistant Eakin has included the computation of the triangles from observations of the previous season, descriptions of stations, duplicates of observations, &c.

2. The *topography* of this section has been continued by Assistant W E. Greenwell, aided during part of the season by Mr. A. M. Harrison The party commenced their work on the 8th of December, and closed i on the 12th of July. They had the use of a small schooner belonging to the survey. The work comprises the completion of sheet No. 1, nea Pascagoula, (see sketch H,) of that embracing Horn island, No. 8, and the five sheets of Mobile bay, including Bonsecours bay, Nos. 9, 10, 11 12, and 13. The area surveyed amounted to seventy-nine square miles and the length of shore line to 249 miles. The whole chain of island from Mobile bay to Lake Borgne, enclosing Mississippi sound on the gulf side, is thus completed, extending over more than a degree of longitude. The country embraced in these sheets is generally level—that o the main shore being marshy and intersected with numerous bayous, th

islands being generally sandy. On the eastern shore of Mobile bay, from Big Point Clear north, the bank rises to forty, and even one hundred feet in height, and the adjacent country is broken and hilly, and quite thickly settled on the immediate shore. The general character of the topography will serve to explain the large extent of shore line compared with the area surveyed.

3. The *hydrography* has made good progress, though the season has been unfavorable, and circumstances unconnected with this department of the public service, and not now necessary to be detailed, caused a much later beginning than I had anticipated. The party under Lieutenant Commanding C. P. Patterson, U. S. N., assistant in the coast survey, left New York, in the schooner Phœnix, on the 21st of December, and was transferred to the steamer Walker on the 16th January; the Phœnix being temporarily loaned to the Engineer department for the use of the board of engineers in a military reconnaissance in Florida. The work was begun in section 8 on the 26th of February, and continued until the 3d of July, during which time hydrographic sheet No. 5 was finished, and No. 6 commenced. Sheet No. 5 takes in the head of Mobile bay and Dog river bar, so called, and includes "the four mouths of the Alabama delta, viz: 1. Mobile river; 2. Spanish river; 3. Apalacha river; and, 4. Blakely river; forming the same number of bars, viz: 1. Dog river bar; 2. Southwest Apalacha bar; 3. South Apalacha bar; 4. Blakely river bar—with their bay and river approaches." The interesting and lucid account of the hydrography of this part of Mobile bay, by Lieutenant Commanding Patterson, will be found in the appendix No. 16. The area included in the soundings is 145 square miles, the number of soundings 71,745, and the number of miles run in sounding 1,160. The area yet to be sounded out in Mobile bay is about 180 miles, and it is estimated that this work and part of the in-shore work in Mississippi sound, and part of the off-shore work on the first coast sheet, including Mobile entrance, may be finished next season; and instructions have been issued accordingly. It is also proposed in them to embrace a reconnaissance of the mouths of the Mississippi river.

The steamer Walker was employed in the general work of the party during the season, under the command of Lieutenant Patterson, U. S. N., and the schooner Nymph in current observations from the 25th of April, in charge of Passed Midshipman J. J. Cook, U. S. N. Thirteen current stations at the entrance to Mobile bay, hydrographic sheet No. 3, (sketch H,) Cat and Ship island harbors, sheet No. 4, and head of Mobile bay, sheet No. 5, have been occupied, at each of which three slack-waters, one flood, and one ebb have been observed, as nearly as possible in the normal condition of the current.

The minute account of the work done by each officer of this party, and the aggregate results, show that great diligence has been used.

Lieutenant Commanding Patterson has presented three reports on buoys and beacons, which his familiarity with the hydrography of this region renders of high value; and I give them, accordingly, in full in the appendix, Nos. 17, 18, and 19: they relate respectively to Dog river bar and channel, and Choctaw Pass, at the head of Mobile bay, to the entrance of Mobile bay, and to Cat and Ship island harbors, in Mississippi and Louisiana. Five beacons are recommended for marking the channel at the head of Mobile bay, seven buoys and five beacons for Mobile entrance, and nine buoys for Cat and Ship island harbors. At present the channels through which the communication between Mobile and the lower bay takes place, are marked only by rude stakes and small bushes. The insufficiency of the marks for the entrance to Mobile bay is clearly set forth by Lieutenant Patterson, and the statistics of wrecks on the outer bar which he gives—the loss amounting in one year to over $60,000—shows that the subject is worthy the attention of the department.

In regard to the buoys for Cat and Ship island harbors, Lieutenant Commanding Patterson remarks: "The want of landmarks makes the necessity of so great a number of buoys.

"The increasing commerce of the coast will, in time, demand greater facilities to navigation, in several beacons and an increased number of buoys; but the buoys named above are deemed sufficient for present purposes."

The importance of the channel south of Cat island, through which a considerable portion of the smaller coasting trade to and from New Orleans must pass, and of Ship island harbor as one of refuge, will be strongly felt as this trade increases, which it is now rapidly doing.

A well merited tribute is paid in the report of Lieutenant Commanding Patterson to the memory of Passed Assistant Surgeon Silas Holmes, United States navy, who was attached to this party: "It has again been our misfortune to be called upon to mourn the loss of a messmate, in the death of Passed Assistant Surgeon Silas Holmes, who was drowned by the capsizing of a boat, in Mobile bay, on May 21st. Possessed of an elevated and investigating mind, with talents of a high order, which had been richly cultivated, Doctor Holmes had won during his short career in the navy the highest honors of his profession, and had his life been spared, would have added to those honors in the more enlarged field which an increase of rank, shortly to have been conferred, must have opened to his labors. The loss of one so qualified for his professiona duties must leave a gap in his own corps not easily to be filled. His character fitted him for all the social intercourse of life. His messmates offer to his afflicted family the tribute of their esteem and admiration o him while living, and their heart-felt sympathy for his loss."

The office work of the party has consisted in the plotting of the soundings on sheets Nos. 3, 5, and 6, copying and reducing the observations o soundings, of tides at Fort Morgan and Cat island, and currents, an representing the results on diagrams. The results of the observations ar of considerable scientific as well as practical interest. Represented o diagrams, they convey information which will be very useful to navigators

The comparison of the number of times of occurrence of high water i the morning and afternoon hours of the different months is given in diagram H *tris*. It shows a remarkable uniformity in the results at Ca island and Mobile point in the same year, and in two successive years a Mobile point.

The connexion between the phenomena of the tides and winds i traceable distinctly in the results of diagram H *tris*.

The construction of the float used by Lieutenant Patterson in curre observations will be understood from the drawings on plate H *tris*, and th description in the appendix No. 20.

Specimens of bottom from the approaches to Mobile bay on the gulf sid and from the immediate entrance, from Grant's pass, from the lower pa of the bay proper, and from the lower section of the bay, were submitte to Professor Bailey, of West Point, for his examination, with the following result: 1st. Nearly all the specimens contain some microscopic organisms. 2d. They are most abundant in the specimens from the outside of the bay, which is the reverse of what I expected. 3d. That the number of new forms is not great, though those that are new are quite curious. 4th. That many common northern species are not present at this locality, and those which do occur are well known cosmopolites. 5th. *That the coarse sandy specimens are, in some cases, richer in microscopic forms than the fine muds.*

SECTION IX.—FROM VERMILLION BAY TO THE BOUNDARY, INCLUDING THE COAST OF PART OF LOUISIANA AND TEXAS.—(Sketch I.)

The survey has made good progress in this section, the triangulation of Galveston upper and lower bays and its dependencies being very nearly completed, so as to admit of the commencement of both topography and hydrography. (See sketch I.) The geographical position of a point in Galveston bay was previously determined in latitude, and approximately in longitude, by connecting it with a point in section VIII. A topographical and a hydrographical party will be added to the astronomical and triangulation party already at work; these parties are under instructions to proceed to the section so as to recommence the survey about the first of December. The very considerable area of four hundred and eighty square miles has been covered by the secondary and tertiary triangulation.

Triangulation.—The triangulation, including main, secondary, and tertiary, has been made by Assistant R. H. Fauntleroy, and under his direction, by Sub-Assistant George Davidson. The party took the field about the middle of December, and remained there until about the middle of July. Notwithstanding the considerable progress already referred to, the season was not favorable, in consequence of its variable character, being marked by frequent and sudden changes of temperature, haze, fog, heavy rains, and high winds. The storms during the winter and spring were of the description called "northers," followed by fresh winds from the southward. In the performance of the work of the season the party suffered much from exposure.

A minute reconnaissance of the upper bay north of Red-fish bar, (see sketch I,) including Turtle bay, was first made and signals erected, and during the measurement of the angles there the signals were placed in San Jacinto and East bays, and the former was triangulated by Sub-Assistant George Davidson. The field work prepared for the plane table includes the whole of Galveston bay, San Jacinto, Turtle and East bays, except that part of East bay lying east of the line "Stevenson Shaw." Thirteen secondary and forty-four tertiary signals have been erected during the season, 2,769 observations were made at nine secondary stations, and 111 at four tertiary stations, by Assistant R. H. Fauntleroy, with the 12-inch Simms repeating theodolite (C. S. No. 18.) 770 observations were made at twelve tertiary stations, by Sub-Assistant Davidson, with the 6-inch Simms repeating theodolite (C. S. No. 22.) Total, 3,650 measures. The number of points determined, including the work of 1848, is 69, the bounding line enclosing an area of 436 square miles; of which about 350 square miles are embraced in the work of this year.

The party has the use of the schooner George M. Bache, in charge of Mr. Andrew S. Hussey, and of a small sloop.

OFFICE WORK.

Under this head is included computing, drawing, engraving, printing and publishing, and instrument making, a particular account of the progress of each of which will be given from the report of Captain A. A. Humphreys, United States topographical engineers, the assistant in charge of the office, and from my personal examinations. The office work has so much increased with the enlargement of the survey, that it is highly desirable to relieve the assistant in charge from many of the details which he is now obliged to attend to personally, by giving him assistance in the supervision of the different branches of the office. The health of Captain Humphreys has seriously suffered from his devotion to the duties of the office, and a change to field duty has become indispensable. His services, which I have heretofore acknowledged in terms of which the strength did not reach the measure of my appreciation of them, must thus for a time be turned into other channels of usefulness to the work. It is not possible to make the review which is thus brought upon me of his career, without impressions which would make my commendations appear exaggerated to those who were not closely conversant with the difficulties overcome, and the system and the efficiency which now prevail. I can only regret that the acknowledgment of his services, which I earnestly recommended in my report of last year, has not yet been made to this meritorious officer. The charge of the office, on the retirement of Captain Humphreys, has been assigned to Brevet Major Isaac J. Stevens, of the corps of engineers, who has recently been detailed, on my application, by the War Department, for service in the coast survey. The engraving and printing have been continued under the charge of Assistant W. M. C. Fairfax. The arrangements for publishing the maps, and the care of the records, instruments, books, and maps, are with Samuel Hein, esq.

Captain T. J. Lee, United States topographical engineers, completed the reductions of his observations, with the West Point mural, of stars, giving discrepant results for latitude at Agamenticus, the Isles of Shoals, Thompson's and Poole's island, by Talcott's method with the zenith telescope. Of twenty pairs selected for examination, the north polar distances of both stars of 16 pairs, and of one of 14 pairs, were remeasured. The change of north polar distance, required from the average of 28 pairs, is $=1''.50$, a number which contains, however, the errors of the mean places determined from observation. That deduced from the discrepancies of the results of all the pairs at these stations severally, from the mean of the whole series of observations, (or probable error of the catalogue in the position of a single star,) was $1''.19$. The correction to the mean latitude, required by the observed and computed polar distances, has the *same sign* in 24 out of 28 pairs.

This work was executed with much care, and the results have been presented with Captain Lee's usual precision and neatness.

Lieutenant J. M. Gilliss, United States navy, whose useful labors in the computations of longitude for the coast survey I have before reported, was in November last relieved from duty on the work, in order to make the preparations for the astronomical expedition to Chili, having special reference to the determination of the solar parallax—an expedition which in his hands cannot fail to realize important fruits for astronomical science and general physics. In his final report, Lieutenant Gilliss states that the comparison of the Edinburgh observations of moon culminations for 1841, with those of Hudson, Washington, and Cambridge, have been completed; also those of European observations, except Edinburgh, for 1842, with the same American observations. During this latter year, observations were discontinued at Washington in June, and at Cambridge in August. The number of comparisons are for Hudson, 80; Washington, 81; Cambridge, 74. In my report of last year I adverted to the fact, that these and other computations of moon culminations showed that our longitudes from Europe must be diminished four seconds in time. Lieut. Gilliss reports that the subsequent computations of 1841 and 1842 confirm his previous suggestion, and give the following summary of the series of results from the computations of 1839–'40–'41–'42:

Two hundred and eight-one comparisons of the first limb of the moon give a correction in the longitude of Washington of 4.81 seconds; 112 comparisons of the second limb give 4.06 seconds; 393 comparisons of both limbs giving 4.60 seconds. "We may therefore conclude, if there be no inherent error in the method, that the true longitude of the capitol will not vary much from five hours eight minutes west of Greenwich." A paper embodying the results of Lieutenant Gillis's work was prepared by him, and communicated by me, with the approval of the Secretary of the Treasury, to the American Philosophical Society, by whom it has been ordered for publication in their Transactions.

A special list of occultations was prepared for the coast survey parties by John Downes, esq., whose general list published by the Smithsonian Institution has been so extensively useful to our astronomers. The thanks of the survey are due to the Secretary of the Smithsonian Institution for copies of this list, and also to Robert Treat Paine, esq., of Boston, for the regular communication of the list which he computes and publishes, and a contribution to the progress of practical astronomy.

An interesting collection of observations of the occultation of the Hyades on the 5th of January, 1849, has been received from the observatory of the Georgetown College, and referred to Mr. Walker. Hereafter such observations, instead of being deposited in the archives of observatories or of single works, will find their way to astronomers generally, through the Astronomical Journal established under the auspices of the American Association for the Advancement of Science. The experience of the coast survey shows that occultations and eclipses may be successfully used for giving small differences of longitude, though they fail in the application to distant places. The differences of longitude between Cambridge, New York, Philadelphia, Washington, and Hudson, as given by these phenomena and by moon culminations, agree very well, according to the reports of Assistant S. C. Walker, with those obtained by the telegraph. The effect of an error in the moon's parallax is so great for places whose distances are considerable, as between Europe and the United States for example, that the results by occultations and eclipses lead to considerable errors. This appears from the computations of both Mr. Walker and Lieutenant Gilliss. It is proposed on this account to rely chiefly on moon culminations and the transportation of chronometers for our longitudes from Europe, using the other results for the correction of the parallax, so as to apply it in cases where distant places on our own continent are not connected by the telegraph. There is no country in the world which has the same advantages for minute precision in the determination of differences of longitude as our own, through the means of the telegraphic lines which already connect the chief marts of trade and commerce. The extension of these lines makes the perfecting of the method of determination a subject of primary importance, and may well employ the active minds and the mechanical skill which are engaged in the problem.

The computations of moon culminations have been continued by Professor A. G. Pendleton, United States navy, on coast survey service, and have been carried through 1843 and 1844, in which years, however, there are few observations on our list, Hudson being the only American observatory where they were made in 1843, and Hudson, Cambridge, and Philadelphia in 1844. The observations in 1845 are more numerous, Washington, Philadelphia, West Point, and Cambridge furnishing them, and these are now in progress of comparison with corresponding European observations.

The following lists show the maps published within the year—those of which the engraving is now completed, those of which the drawing is completed, those which are in the course of engraving, and of which the drawing is in progress. From these lists are excluded the editions of maps published within the year from plates previously engraved, and the maps drawn or tracings made for the records of the survey, or for communication to public bodies and to individuals, under the authority of the Treasury Department. The detailed list of the work done in the office, or in connexion with it, by those employed, giving to each his share of credit in the programme, will be given as usual from the report of the assistant in charge. A complete list of maps published up to January, 1849, is given, from my special report to the Treasury Department in February last, in the appendix.

Maps and sketches published—

Maps.—1. Nantucket harbor; 2. Cawkin's and Sheffield Island harbors, Long Island sound; 3. Harbor of refuge at entrance to Chester river, Chesapeake; 4. Anchorage of Captain's islands, east and west, Long Island sound; 5. Long Island sound No. 2, from New London to New Haven. *Sketches*.—6. Buttermilk channel, New York harbor; 7. Hatteras cove, North Carolina; 8. Hatteras inlet, North Carolina; 9. Bull's bay, South Carolina.

Maps and sketches engraving—

1. Hyannis harbor, Massachusetts; 1 *bis*. South side of Long Island No. 1; 2. Patapsco river and Baltimore harbor and approaches, (two sheets;) 3. Long Island sound No. 1, from New Haven to New York city; 4. Off-shore chart from Point Judith to Cape Henlopen; 5. Chesapeake bay No. 1, from the head of the bay to the Patapsco river; 6. Eastern series No. 1, Point Judith to Cuttyhunk; 7. Boston harbor; 8. Sachem's Head and City Island harbors, Long Island sound; 9. Cat and Ship Island harbors, Mississippi and Louisiana, double sheet; 10. Pasquotank river, North Carolina; 11. Delaware bay No. 1, entrance sheet, re-engraving; 12. Seventeen sketches of progress of the survey for the annual report.

Maps and sketches of which the drawing has been completed—

1. Topography of off-shore chart from Point Judith to Cape Henlo-
en; 2. Topography of south shore of Long Island sound No. 1, 3. Cat
nd Ship Island harbors; 4. Sketch of Buttermilk channel; 5. Sketch
f Hatteras cove; 6. Sketch of Hatteras inlet; 7. Sketch of Bull's bay.

The following drawings are in hands—

1. Map of Boston harbor, six sheets nearly finished; 2. Duplicate
f the foregoing also nearly completed; 3. The Boston harbor map
for engraving) is more than half finished; 4. The chart of Muskeget
hannel and its approaches is nearly completed; 5. The topography of
e map of Hell Gate, near New York, is nearly completed; 6. The to-
ography of Chesapeake bay (sheet No. 1) is three-fourths done; 7. The
eduction of the Patapsco map from the re-survey is advanced as far as
he field-work will admit.

The particulars of the office-work, classified under the heads of com-
uting, drawing, engraving, printing, and publishing, as given in the
eport of Captain Humphreys, are given in the following pages:

COMPUTING.—*Eugene Nulty, esq.*, has computed the observations for
me and for latitude, with the zenith telescope, at the stations Agamenti-
us and Isle of Shoals, section I; has computed the observations for time,
r latitude, with the zenith telescope, and for azimuth, at the stations
nkonoonuc, section I, and Dollar Point, Texas, section IX; has computed
e observations for latitude by Professor Loomis at Mitchell's observa-
ry, Nantucket; has computed the magnetic observations of Mr. Faunt-
eroy in 1847, in sections I and II, and in 1848 in section IX, and of
aptain T. J. Lee, topographical engineers, 1845, '46, '47, and '48.

Assistant Theo. W. Werner has computed the secondary triangulation
f Captain T. J. Cram, topographical engineers, in section I, in 1847 and
848; the secondary triangulation of Assistant C. O. Boutelle in section I,
848; the primary and secondary triangulation of Assistant Ed. Blunt in
hesapeake bay, section III, 1848; the secondary triangulation of
ssistant John Farley, south of Cape Henlopen, in section III, 1848;
ssistant A. W. Longfellow's triangulation, Bodie's island, section IV,
848; Assistant F. H. Gerdes's primary and secondary triangulation,
ection VIII, 1848; Assistant C. M. Eakin's secondary triangulation of
obile bay, in 1848 and 1849; Assistant R. H. Fauntleroy's primary and
econdary triangulation, Galveston bay, in 1848 and 1849. He has also
ecomputed the primary triangulation, with the angles of verification, in
e Chesapeake bay, from Turkey point to the Kent Island base; ad-
usted the secondary triangulation of Chesapeake bay, from the head of
e bay to the Patuxent river, to the primary; has compared the first and
econd set of computations of the observations for latitude with the zenith
elescope at Fort Morgan and Pascagoula, section VIII, and made, be-
ides, some miscellaneous geodetic computations.

Assistant J. E. Hilgard, under immediate direction of the superin-
endent, and aided by Messrs. J. Hewston, jr., F. Emory, and C. Schott,
iscussed the horizontal angles by the method of least squares, at the
ations McSparran, Great Meadow, North Base, South Base, Shootflying
ill, Spencer, Copecut, Quaker, Indian Hill, Cuttyhunk, Beacon Pole,
nd Unkonoonuc, in section I; and at the stations Linstid, Webb, North
ase, South Base, Taylor, Marriott's, Hill's, Causten's, and Theological
eminary, in section III; computed the equations of condition from the
eometrical relations of the figure of the primary triangulation in section
, in 1844 and 1845, and compared the results with those of the first or

preliminary computation; discussed the relative value of observation according to the description of signals, and the comparison of the bas bars with the standard by the method of least squares; discussed the connexion of the elongation mark with the triangulation at stations Spencer Beaconpole, and Shootflying; by the method of least squares; obtaine the resulting angles at the stations Hill's, Causten's, Theological Seminary, Linstid, and Webb's, section III, and made a preliminary computation of the sides of the triangulation from Kent Island base to Washington city, and computed the equations of condition; made the first computation of the observations for azimuth at the station Unkonoonuc, section I, in 1848; recomputed the observations for azimuth at the station Spencer, Copecut, and Indian Hill; revised Professor A. D. Bache's discussion of the azimuths in section II, previous to 1844, and discusse the azimuths at Champlin and Deakyne, section II, and at North bas (Kent island) and Finley, section III; discussed the azimuths in sectio I, for probable error and station error, and made a report upon Bessel' formulæ for the geodetic computation of latitudes, longitudes, and azimuths.

Assistant Hilgard left the office for the field about the first of April.

Mr. C. A. Schott, previous to joining Lieutenant Commanding Alden' party in April, compared the first and second set of computations of th observations for latitude with the zenith telescope, at station Unkonoonuc

G. Rumpf, esq., has been engaged in the office since the 1st of Apri and has compared and corrected the first and second sets of computation of the observations for the latitude, with the zenith telescope, at the stations Dollar Point, Taylor, Poole's Island, Agamenticus, and Isle of Shoal and made out the resulting latitudes; corrected the two computations latitude at Fort Morgan and Pascagoula, from Assistant Werner's memo randa of comparison; has compared and corrected the first and second s of computations of the observations for azimuth at Unkonoonuc and Do lar Point; has determined the probable errors of observation and of pos tion of stars as given in the British Association catalogue, from the obse vations and computations for latitude with the zenith telescope, at the st tions Thompson, Isle of Shoals, Agamenticus, Unkonoonuc, Taylo Poole's Island, Fort Morgan, Pascagoula, and Dollar Point; and mad miscellaneous computations.

DRAWING.—*Assistant W. M. C. Fairfax* has had charge of the drawing during the latter part of the year. He has prepared the reduced ma for the engraver, and made or superintended the making of the projectio on the copper plates of the maps placed in the engravers' hands this yea The sketches for the yearly report have been prepared under his directio He has also had charge of the engraving: he has, besides, continued t reduction and drawing of part of No. I (the western sheet) of Lo Island sound, of the eastern series, sheet No. 1, and of part of the top graphy of the off-shore map.

Assistant M. J. McClery was engaged upon the drawing of the Bost harbor map (scale $\frac{1}{20000}$) for the commissioners of the State of Massach setts, until the close of January. Since then he has continued the redu tion and drawing of the topography of the upper sheet (No. 1) of t Chesapeake bay map, scale $\frac{1}{80000}$, which is nearly completed. He h also reduced and drawn the Patapsco map as far as the condition of t plane-table sheets will admit of it; has made the projection on copper f e lower sheet of the Delaware bay map, besides diagrams, and some iscellaneous reductions and drawings.

F. Schroeder, esq., has been engaged in the drawing of the topography the second map of Boston harbor, scale $\frac{1}{20000}$, for the commissioners the State of Massachusetts, which was finished in April. In order to present the hydrography clearly, it was determined to shade the bottom om the shore to the 18-feet curve with the pen, and Mr. Schroeder has en accordingly employed upon this in both the maps; this has delayed e completion of the maps some time.

John Robertson, esq., has been engaged in reducing, transferring, draw- g, and lettering the maps of Boston harbor for the commissioners; he is also been engaged upon their hydrography; upon the reduction of the ydrography of Boston harbor map, scale $\frac{1}{40000}$; has made a copy of the ap of Cumberland sound and the approaches, obtained from the Topo- aphical Bureau, War Department, and of the general map from the St. ary's river to the St. John's river, also obtained from the Topographical ureau.

Joseph Welch, esq., has been engaged upon the reduction and drawing the topography of the Boston harbor map for engraving, (scale $\frac{1}{40000}$;) is inked the topography of part of sheet No. 1, eastern series map, and ade part of a traced map of Key West harbor, obtained from the Topo- aphical Bureau, War Department.

J. H. Adams, esq., completed the reduction of the topography of the isquotank river map, scale $\frac{1}{60000}$; has made the diagram and assem- age maps of section VIII; has reduced and drawn half the topography of e map of Muskeget channel, the hydrography reduced by Lieutenant ommanding C. H. Davis's party, scale $\frac{1}{60000}$, besides tracing and mis- llaneous drawings; he joined Mr. Glück's plane-table party in the field the 12th June.

Charles Mahon, esq., was engaged upon the hydrographic sheets of ieutenant Commanding Patterson's party until January; since then he is reduced the hydrography of the Pasquotank river map, scale $\frac{1}{60000}$; is reduced the map of the harbors of Cat and Ship islands; has reduced e topography of the off-shore map, scale $\frac{1}{400000}$, it having been deter- ined to add to it such topography as would prove useful to the naviga- r; has made tracings from the plane-table sheets from New Bedford to e head of Buzzard's bay, furnished to the honorable Mr. Grinnell, by rection of the Treasury Department; has transferred and drawn the pography in part of the Hell Gate map, scale $\frac{1}{5000}$; besides some acings.

J. M. Wampler, esq., has finished the reduction and drawing of the pography on the south shore of sheet No. 1, Long Island sound map; is made the projections for two plane-table parties and one reconnais- nce party, many of the sketches for the yearly report of 1848, part of e traced copy of the map of Key West harbor, besides being engaged oon miscellaneous duties; he joined Mr. Cutts's plane-table party in e latter part of April.

W. Luce, esq., has been engaged upon the diagram maps of sections III, and IV, upon drawings of the base apparatus, upon tracings and ojections for hydrographic parties, upon project maps, and tracings for ld parties; he has, besides, had charge of the electrotype apparatus from ay to October.

C. J. Whiting, esq., was employed in the office during the mont of January, and reduced the chart of harbor of refuge of Hart and Cit islands, scale $\frac{1}{20000}$, and made some plottings, &c.

J. J. Ricketts, esq., after finishing the maps and diagrams of Lieutenan Commanding Richard Bache's party, including the reduction of the hydrography of sheet No. 1, general coast map, of the south shore of Long Island joined the office in June, and has reduced for publication the reconnaissance charts of Bull's bay, harbor of refuge, scale $\frac{1}{40000}$, Hatteras cove scale $\frac{1}{20000}$, and Hatteras inlet, scale $\frac{1}{20000}$; has made tracings of th above; has made two copies (traced) of the hydrography of the channel leading past Sandy Hook into New York bay, from the soundings of 183 and 1848, for comparison; has made in part the reduction and drawing c the map of the entrance to Mobile bay, scale $\frac{1}{40000}$, upon which he i now engaged.

C. A. Schott, esq., joined the office from Lieutenant Commanding Alden's party on the 10th July, and has been engaged upon miscellaneou work; has prepared projections for two hydrographic parties; has mad some geodetic computations, some plottings, tracings, and tidal reductions; and has reduced and drawn part of the hydrography of the map Muskeget channel, scale $\frac{1}{60000}$, left unfinished by J. H. Adams, esq rejoined Lieutenant Commanding Alden's party early in October.

A. Fornaro, esq., has been employed in the office since July in r ducing sketches for the yearly report; in making various tracings for fiel parties and for the office; in making diagrams; and in preparing the a semblage map of section IV, upon which he is now engaged.

Eugene Hesse, esq., has been employed since July in making redu tions for yearly report; traced maps for field parties; and in reducing th plane-table sheets of sections I and III to the assemblage maps.

HYDROGRAPHY.—*Lieutenant Maxwell Woodhull*, United States nav was engaged upon tidal reductions until he took the field in May last.

Lieutenant S. C. Barney, United States navy, was engaged upon th reduction of the hydrography of Chesapeake bay, from Poole's island the south end of Kent island, $\frac{1}{80000}$, until relieved from the coast surve

The drawings required by the hydrographic results of each season a made by the parties who executed the work afloat, and, therefore, do n come into the detail of office-work.

ENGRAVING.—*Assistant W. M. C. Fairfax* has had charge of the e graving. The engraving of the maps of the harbors of Cawkin's a Sheffield islands, by R. Pettit and R. Knight; of the harbors of Captain island east and Captain's island west, by A. Rollé and R. Pettit; of t mouth of Chester river, by F. Dankworth and W. Smith, have be completed. The engraving of the middle sheet of the map of Lo Island sound by S. Siebert, A. Rollé, and J. Knight, has been complete excepting the correction in the hydrography at the mouth of the Conne ticut river from re-survey during the past summer, the results of whi have not yet been received. The engraving of the map of the Pasqu tank river has been nearly completed by O. A. Lawson, W. Smith, a R. Pettit; the engraving of the western sheet of Long Island sound h been continued by Messrs. Siebert, Rollé, and J. Knight; and of No. eastern series, by J. Knight; and of No. 1, Chesapeake bay, by F. Dan worth; part of the topography of the off-shore map has been engraved O. A. Lawson; the engraving of the Boston harbor map has been beg

A. Rollé; the engraving of the harbor of Sachem's Head has been arly finished by R. Knight.

In endeavoring to obtain a copy of the lower plate of the map of Dela- are bay by the electrotype process, the original plate was so much injured at it became necessary to re-engrave it; the re-engraving was begun in ne by Messrs. F. Dankworth, J. Knight, O. A. Lawson, and W. nith, and will be completed about the last of December.

The maps of Hyannis harbor, and of the harbors of Cat island and ip island, have been engraved by contract with Messrs. Sherman & nith, New York. These maps are completed, excepting the sailing di- ctions. As yet it has been impossible to effect, out of the office, any rangement for completing the engraving of the topography of the off- ore map. The sketch-charts of Buttermilk channel, Hatteras cove, Hat- as inlet, and Bull's Bay harbor, have been engraved in the office by R. ttit, R. Knight, and H. Knight. The sketches accompanying the an- ual report have also been engraved in the office, principally by R. Knight d H. Knight.

Printing.—Since the first of November, 1848, there have been printed 914 sheets of Delaware bay and river, (the map consists of three sheets,) 5 sheets of the large and 350 copies of the small map of New York bay d harbor, 892 copies of the harbor of Nantucket, 1,323 copies of Hunt- gton bay, 1,300 of the harbors of Captain's islands, east and west, 640 of e mouth of Chester river, 400 of Oyster bay, 457 of New London har- r, 400 of the harbor of Holmes's Hole and of Tarpaulin Cove, 340 of e harbor of New Bedford, 400 of Fisher's island sound, 400 of Annapo- harbor and Severn river, 350 of New Haven harbor, 500 of Little Egg rbor, 757 of the harbors of Black Rock and Bridgeport, 450 of Edgar- wn harbor, 890 of the harbors of Cawkin's island and Sheffield island; aking in all 12,728 sheets.

Besides these there were 283 copies from finished and unfinished plates inted, 650 from the sketch plates, 300 copies of New South shoal sketch, 0 of Buttermilk channel, New York harbor, 100 circular protractors d diagrams, scales of shade, and proofs of the plates in the engravers' nds.

Publishing.—At the date of the last report, 21 sheets of coast survey aps had been published: since then five sheets have been added, making e number now published 26. Besides these, three sheets are nearly ady for publication.

Since November, 1848, 516 sheets of the map of Delaware bay and ver, 174 copies of Nantucket harbor, 174 copies of the harbors of Caw- n's and Sheffield islands, have been distributed to scientific and literary stitutions in the United States.

By direction of the Treasury Department, and for use on the survey, 0 sheets of the large map of New York bay and harbor, 46 copies of the all map of New York bay and harbor, 159 sheets of the map of Dela- are bay and river, and approaches, 65 copies of New Bedford, 87 copies Fisher's island sound, 54 copies of Annapolis roads and Severn river, copies of New Haven, 55 copies of the harbors of Holmes's Hole and arpaulin Cove, 47 copies of Little Egg harbor, 65 copies of Oyster bay, copies of New London harbor, 65 copies of the harbors of Block Rock d Bridgeport, 63 copies of the harbor of Edgartown, 11 copies of the rbors of Cawkin's island and Sheffield island, 14 copies of the harbor of Nantucket, and 4 copies of the second sheet of Long Island sound, hav been distributed. The whole number of sheets distributed is 1,848.

There have been turned over to the disbursing officer of the coast su vey, to be placed with agents for sale, 975 sheets of the large map of Ne York, 326 copies of the small map of New York, 830 sheets of Delawa bay and river, 170 copies of Fisher's island sound, 376 copies of Ne Bedford, 163 of Annapolis, 124 of New Haven, 282 of Little Egg harbo 160 of Holmes's Hole and Tarpaulin Cove, 227 of Oyster bay, 295 New London, 297 of Edgartown, 337 of Black Rock and Bridgeport, 46 of Sheffield island and Cawkin's island, 454 of Nantucket harbor, 523 Huntington bay, 500 of Captain's islands, east and west, 40 of mouth Chester river, being in all 6,483 sheets of maps.

INSTRUMENT MAKING AND REPAIRS.—The alterations, repairs, dividin and cleaning required by the instruments of the field and office partie generally, have been made, during the past year, under the direction Joseph Saxton, esq.

Besides these, iron has been substituted for wood in four of the trestl for the base apparatus, changes have been made in their slides, and a apparatus for transferring the end of the bars to the ground has bee made; three ten-inch and one six-inch Gambey theodolites have had Y and telescopes fitted to them for observing horizontal angles; four ne telescopes have been mounted on divided stands; astronomical cloc registers for observations in connexion with the magnetic telegraph hav been made; a new heliotrope, a three-armed protractor, metre scales, bea compasses, steel rulers and triangles, reducing frames and chains, hav been made.

DECEMBER, 1849.

Very respectfully submitted by

A. D. BACHE,
Superintendent U. S. Coast Survey.

HON. W. M. MEREDITH,
Secretary of the Treasury.

Distribution of the parties of the coast survey upon the coast of the United States, during the surveying seasons, in the different parts of the coast, from November, 1848, *to November*, 1849.

No. of section of survey.	Limits included in several sections.	No. of parties in section.	Operations.	Persons conducting the operations.	Localities of the several operations.
I.	Passamaquoddy bay to Point Judith, including the coast of Maine, New Hampshire, Massachusetts, and Rhode Island.	1	Primary triangulation, astronomical and magnetic observations.	A. D. Bache, superintendent, assisted by George Davidson, sub-assistant, and George W. Dean.	Pattuccawa mountain, New Hampshire, and Mount Independence, near Portland, Maine.
			Reconnaissance - -	A. D. Bache, superintendent, and C. O. Boutelle, assistant.	Reconnaissance for extension of primary triangulation in Maine, (preliminary reconnaissance east, to the Penobscot,) part of season.
		2	Magnetic observations -	Professor G. W. Keely	Magnetic variation, &c., near Nahant, Marblehead, Salem, Gloucester, and Annisquam, Massachusetts.
		3	Secondary triangulation -	Captain T. J. Cram, United States topographical engineers, assistant.	Western shore of Massachusetts bay, and from Seabrook, in New Hampshire, to Saco, in Maine; reconnaissance made, and secondary triangulation commenced.
		4	Do - -	C. O. Boutelle, assistant, C. P. Bolles, sub-assistant.	Cape Ann completed from Manchester, Massachusetts, to the New Hampshire line.
		5	Topography - -	H. L. Whiting, assistant, J. M. Wampler, sub-assistant, A. M. Harrison, (triple party.)	From near Lynn, Massachusetts, to include Salem harbor; low-water line, Boston harbor, north side, and islands.
		8	Do - -	J. B. Glück, assistant, J. H. Adams, sub-assistant.	Topography near Harwich, Cape Cod; low-water line, Boston harbor, south side.
				Captain A. A. Humphreys, United States topographical engineers, assistant.	Inspection and verification of topography on Cape Cod.
				A. D. Bache, superintendent.	Inspection of progress of parties.

APPENDIX No. 1—Continued.

No. of section of survey.	Limits included in several sections.	No. of parties in section.	Operations.	Persons conducting the operations.	Localities of the several operations.
I.	Passamaquoddy bay to Point Judith, &c.—Continued.	9	Hydrography - -	Lieutenant Commanding Charles H. Davis, United States navy, and Lieutenant Commanding Charles H. McBlair, United States navy, assistants; Lieutenant Commanding J. N. Maffitt, United States navy, (double party.)	Nantucket shoals, Nantucket sound, and Bass river and Wellfleet harbors, Cape Cod.
		11	Do - -	Lieutenant Commanding J. R. Goldsborough, United States navy, assistant.	Tidal observations in Martha's Vineyard sound.
II.	Point Judith to Cape Henlopen, including the coast of Connecticut, New York, New Jersey, Pennsylvania, and Delaware.	1	Astronomical observations	Captain T. J. Lee, United States topographical engineers, assistant.	Observations of declinations of stars giving doubtful latitudes, with West Point mural, in early part of year.
		2	Magnetic observations -	Joseph S. Ruth, sub-assistant.	Determination of constants of magnetic instruments, in early part of year.
		3	Auxiliary triangulation -	Professor A. G. Pendleton, United States navy.	Triangulation in connexion with verification work of hydrography, south side of Long Island, part of season.
		4	Topography - -	H. L. Whiting, assistant	Topography near Hell Gate resurveyed.
		5	Hydrography - -	Lieutenant Augustus S. Baldwin, United States navy, assistant.	Verification work on south side of Long Island, from middle of Oak beach south, including Rockaway inlet.
		6	Do - -	Lieut. Maxwell Woodhull, United States navy, assistant.	Hydrography of Little Hell Gate, part of season; placing buoys in New York harbor.

				Thornton A. Jenkins, United States navy, assistant.	part of season.
III.	Cape Henlopen to Cape Henry, including the coast of Delaware, Maryland, and Virgidia.	1	Primary triangulation; secondary triangulation.	Edmund Blunt, assistant; S. A. Gilbert, sub-assistant.	Continuation of the triangulation of the Chesapeake to the Rappahannock, and up the Potomac to the line Cornfield Point-Hall; Mr. Gilbert assistant from August to close of October.
		2	Primary triangulation and astronomical and magnetic observations.	A. D. Bache, superintendent; J. Hewston, sub-assistant.	Verification work; continuation of triangulation from Chesapeake to Capitol and Observatory, Washington, &c.; magnetic observations on Kent island for chart of Chester river entrance.
		3	Secondary triangulation -	John Farley, assistant -	Continuation of triangulation of outer side of Eastern-shore peninsula, from work of last year to Assateague light-house, in Virginia.
		4	Tertiary triangulation -	R. D. Cutts, assistant -	Triangulation for plane-table work of Nanticoke.
		4 (*bis.*)	Topography - -	R. D. Cutts, assistant, aided by John Seib, and, during part of the season, by J. M. Wampler and S. A. Wainwright, (triple party.)	Eastern shore of Maryland; western shore of Virginia, between the Potomac and Rappahannock.
		7	Do - -	George D. Wise, assistant	Examination of Patapsco; topography of outer shore of peninsula of Eastern shore, from Indian River inlet to Green Run inlet.
		8	Do - -	J. B. Glück, assistant -	Verification work in Patapsco, part of the season.
			Do - -	Capt. A. A. Humphreys, United States topographical engineers, assistant.	Inspection of work on Patapsco.
		9	Hydrography - -	Lieutenant Commanding S. P. Lee, United States navy, assistant; Lieut. Commanding R. Wainwright, (double party.)	Hydrography of outer coast, from Isle of Wight shoal to mouth of Green river inlet; hydrography of Chesapeake, from work of last year to line Smith's Point light-house, Shank's; sailing directions for Chesapeake, &c.; placing of buoys in Chester river.
			Do - -	Lieutenant Commanding James Alden, United States navy, assistant.	Examination of buoys, Chester river entrance.
II. III. IV.		–	Do - -	Lieutenant Commanding Thornton A. Jenkins, United States navy, assistant.	Off-shore soundings, (deep sea,) from capes of the Delaware to south of the capes of the Chesapeake.

APPENDIX No. 1—Continued.

No. of section of survey	Limits included in several sections.	No. of parties in section.	Operations.	Persons conducting the operations.	Localities of the several operations.
IV.	Cape Henry to Cape Fear, coast of part of Virginia and North Carolina.	1	Measurement of base -	A. D. Bache, superintendent; C. O. Boutelle, assistant.	Measurement of base on Bodie's island completed.
		2	Main and secondary triangulation.	W. M. Boyce, assistant -	Triangulation of Croatan, Roanoke, and Currituck sounds continued.
		3	Tertiary triangulation and topography.	A. W. Longfellow, assistant.	Alligator river completed; outer coast from Nag's Head to south of inlet of 1846.
		4	Tertiary triangulation -	J. Hewston, sub-assistant	From Bodie's island base south to near Cape Hatteras.
		5	Topography - -	J. J. S. Hassler, assistant	Shores of Croatan, Roanoke, and Currituck sounds; Yeopim river.
		6	Hydrography - -	Lieutenant Commanding Thornton A. Jenkins, United States navy, assistant.	Hydrography of Albemarle sound, part of season.
			Do - -	Lieutenant Commanding James Alden, United States navy, assistant.	Entrance to Alligator river; reconnaissance of Hatteras inlet, (harbor of refuge,) and of Bodie's island inlet of 1846.
		7	Do - -	Lieutenant Commanding J. N. Maffitt, United States navy, assistant.	Hydrographic reconnaissance of Hatteras cove, (harbor of refuge.)
V.	Cape Fear to the St. Mary's river, coast of South Carolina and Georgia.	1	Measurement of base -	A. D. Bache, superintendent; C. O. Boutelle, assistant; C. P. Bolles, sub-assistant.	Measurement of base on Edisto island commenced.
		2	Main and secondary triangulation, and astronomical and magnetic observations.	C. O. Boutelle, assistant; J. Hewston, sub-assistant.	Measurement of preliminary base and triangulation of Charleston harbor, astronomical and magnetic observations connected with the triangulation at Breach Inlet station.
		3	Reconnaissance - -	C. P. Bolles, sub-assist-	Minute reconnaissance for sides of primary triangles from Edisto base to Charleston.

				ant.	
		5	Hydrography - -	Lieutenant Commanding J. N. Maffitt, U. States navy, assistant.	Hydrography of approaches to Charleston harbor; reconnaissance of Bull's bay (harbor of refuge.)
				A. D. Bache, superintendent.	Examination of Edisto island base, and inspection of progress of work.
VI.	St. Mary's river to the St. Joseph's, eastern coast of Florida.	1	Reconnaissance - -	F. H. Gerdes, assistant -	Reconnaissance of the Florida Keys and of part of the main, from Cape Florida to the Tortugas. (Under instructions to measure preliminary base near Cape Florida, and to commence the main triangulation there, and for general reconnaissance from Cedar Keys, southward.)
		2	Astronomical and magnetic observations, and secondary triangulation.	J. E. Hilgard, assistant -	Observations for latitude and azimuth at Sand Key, measurement of preliminary base and triangulation to connect with survey of topographical engineers, near Key West; magnetic variation, &c., near Key West; triangulation near Bahia Honda.
		3	Secondary triangulation -	J. E. Hilgard, assistant; J. H. Adams, sub-assistant. (Double party.)	Under instructions to commence triangulation from Key Biscayne towards Carysfort reef.
		5	Hydrography - -	Lieutenant Commanding John Rodgers, United States navy, assistant.	Reconnaissance of entrance to St. Mary's and St. John's rivers, under instructions for hydrography of approaches to Key West harbor, Bahia Honda, the Florida reef southwest from Cape Florida, &c.
VII.	St. Joseph's river to Mobile bay, western coast of Florida.	1	Reconnaissance - -	F. H. Gerdes, assistant -	Reconnaissance from Mobile bay to Pensacola bay, inclusive, (part of season.)
VIII.	Dauphin island to Vermillion bay, coast of Alabama, Mississippi, and part of Louisiana.	1	Primary and secondary triangulations.	F. H. Gerdes, assistant -	Primary triangulation continued to Chandeleur islands, (part of season.)
		2	Secondary triangulation -	C. M. Eakin, assistant -	Triangulation of part of Mobile bay, Bonsecours bay, and of delta of rivers emptying at Mobile.
		3	Do - -	George Davidson, sub-assistant.	Under instructions to continue secondary triangulation from Cat island and Chandeleurs to southward, and astronomical and magnetic observations at Cat island.
		4	Topography - -	W. E. Greenwell, assistant.	Topography of islands south of Mississippi sound completed, of west shore of Mobile bay from Cedar Point to Deer river, and the east shore, including Bonsecours bay.
		5	Hydrography - -	Lieutenant Commanding C. P. Patterson, United States navy, assistant.	Hydrography of Mobile bay entrance and upper sheet; tides and currents near Cat island and Mobile point.

APPENDIX No. 1—Continued.

No. of section of survey.	Limits included in several sections.	No. of parties in section.	Operations.	Persons conducting the operations.	Localities of the several operations.
IX.	Vermillion bay, to the boundary; part of Louisiana and Texas.	1	Main and secondary triangulation.	R. H. Fauntleroy, assistant; George Davidson, sub-assistant.	Main and secondary triangulation of Galveston lower and upper (Anahuac) bays nearly completed. (Under instructions to resume operations, &c.)
		2	Topography - -	J. M. Wampler, sub-assistant.	Under instructions to commence the topography of Galveston bay.
		3	Hydrography - -	Lieutenant Commanding Augustus S. Baldwin, United States navy, assistant.	Under instructions to commence the hydrography of Galveston lower bay and approaches.
X.	Western coast of the United States.	1	Reconnaissance; main and secondary triangulation; astronomical and magnetic observations connected with it; topography.	J. S. Williams, assistant; Brevet Major Hammond, United States army, assistant; Joseph S. Ruth, sub-assistant.	Under instructions to make a general reconnaissance of the coast of Oregon; to determine the necessity of the light-houses at the mouth of Columbia river, and to commence the triangulation and astronomical observations connected with it at the entrance to Columbia river or in Puget's sound.
		2	Hydrography - -	Lieutenant Commanding Wm. P. McArthur, United States navy, assistant.	Under instructions to unite in examination in regard to light-houses; to re-examine entrance to Columbia river; and to commence hydrography in connexion with foregoing land operations.

APPENDIX No. 2.

Results of the coast survey at different periods from 1807 *to* 1849.

	From 1807 to 1819.	From 1832 to 1844.	From 1844 to 1849.	Totals.
Reconnaissance, area in square miles	560	18,103	22,544	41,207
Triangulation do do	450	14,483	*19,309	34,242
Extent of coast line	-	310	405	715
Extent of shore line, reckoning bays, sounds, &c.	-	3,215	4,211	7,426
Astronomical stations, number of	3	11	47	61
Magnetic stations do	-	10	88	98
Vertical angles do	-	7	34	41
Base lines do	-	1	4	5
Preliminary base lines do	2	-	3	5
Topography, area in square miles	-	6,222	2,755	8,977
Length of shore line	-	6,100	4,055	10,155
Hydrography, area in square miles	-	†9,623	‡15,910	25,533
Hydrography, number of soundings	-	808,147	951,002	1,759,149
Gulf-stream, number of soundings for temperature	-	-	1,410	1,410
Gulf-stream, fathoms of line	-	-	139,747	139,747
Current stations, number of	-	-	223	223
Tidal stations do	-	13	60	73
Specimens of bottom do	-	500	4,098	4,598
Total number of manuscript maps	-	326	295	‖621
Of these manuscript maps, number prepared in office, being reductions, &c.	-	29	123	152
Original topographical maps, number of	-	160	100	§260
Containing sheets do	-	298	131	429
Original charts do	-	103	72	¶175
Duplicates	-	34	-	34
Containing sheets, number of	-	236	160	396
Records, triangulation bases, &c., number of volumes	4	95	233	332
Astronomical observations, &c., number of vols.	1	16	140	157
Computations, geodetic, &c. do	1	78	138	217
Computations, astronomical do	2	4	138	144
Magnetic observations do	-	4	37	41
Magnetic computations do	-	-	15	15
Geodetic books, duplicates do	1	26	128	155
Meteorological books do	-	2	7	9
Meteorological books, duplicates do	-	-	3	3
Original hydrographical books, soundings, and angles, number of volumes	-	179	380	559
Duplicate hydrographical books, soundings, and angles, number of volumes	-	27	32	59
Hydrographical books, tidal and current observations, and tidal reductions, number of vols.	-	8	158	166
Astronomical differences of longitude	-	-	66	66
Total of records	9	439	1,373	1,928
Engraved plates of maps, number of	-	5	24	29
Engraved plates, electrotyped do	-	-	8	8
Published maps do	-	-	21	21
Printed sheets of maps do	-	-	24,249	24,249
Printed sheets of maps distributed, number of	-	-	7,678	7,678
Printed sheets of maps, sale agents do	-	-	12,979	12,979
Volumes in the library	-	-	-	655
Instruments, &c., value of	-	-	-	$149,513

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* In sections III, IV, VIII, and IX, the primary and secondary triangulations are united in general.

† 5,000 of off-shore work.

‡ 11,000 of off-shore work.

‖ 11,215 square feet of paper.

§ 4,056 square feet of paper.

¶ 5,891 square feet of paper.

APPENDIX No. 2 *bis*.

List of coast survey maps engraved.

No. 1.	New York bay and harbor and approaches	$\frac{1}{80000}$
2.	...Do......do......do......do ...... No. 1......	$\frac{1}{30000}$
3.	...Do......do......do......do ...... No. 2......	
4.	...Do......do......do......do ...... No. 3......	
5.	...Do......do......do......do ...... No. 4......	
6.	...Do......do......do......do ...... No. 5......	
7.	...Do......do......do......do ...... No. 6......	
8.	Part of the southern coast of Long Island, No. 1	$\frac{1}{80000}$
9.	Map of Delaware bay and river and approaches, No. 1	$\frac{1}{80000}$
10.	....Do........do........do........do....No. 2	
11.	....Do........do........do........do....No. 3	
12.	The harbor of New Bedford	$\frac{1}{40000}$
13.	The harbor of New London	$\frac{1}{20000}$
14.	Fisher's Island sound	$\frac{1}{40000}$
15.	Holmes's Hole and Tarpaulin Cove harbors	$\frac{1}{20000}$
16.	Oyster, or Syosset bay	$\frac{1}{30000}$
17.	Little Egg Harbor	$\frac{1}{30000}$
18.	Harbor of Annapolis	$\frac{1}{60000}$
19.	New Haven harbor	$\frac{1}{30000}$
20.	Harbor of Edgartown	$\frac{1}{20000}$
21.	Harbors of Black Rock and Bridgeport	$\frac{1}{20000}$
22.	Huntington bay	$\frac{1}{20000}$
23.	Nantucket harbor	$\frac{1}{20000}$
24.	Harbors of Sheffield and Cawkin's islands	$\frac{1}{30000}$
25.	Mouth of Chester river	$\frac{1}{20000}$
26.	Harbors of Captain's islands, east and west	$\frac{1}{20000}$
27.	Long Island sound, sheet No. 3	$\frac{1}{80000}$
28.	....Do..........do....No. 2	
29.	Sketch chart of Nantucket shoals	$\frac{1}{200000}$
30.	Sketch chart of Buttermilk channel, New York harbor	$\frac{1}{500000}$
31.	Sketch chart of Cape Hatteras cove	$\frac{1}{20000}$
32.	Sketch chart of Cape Hatteras inlet	$\frac{1}{20000}$
33.	Sketch chart of Bull's bay harbor	$\frac{1}{40000}$

Maps engraving.

No. 1.	The off-shore map from Point Judith to Cape Henlopen	$\frac{1}{40000}$
2.	The map of Boston bay and harbor and the approaches,	$\frac{1}{4000}$
3.	Eastern series map, extending from Point Judith to Nantucket channel, sheet No. 1	$\frac{1}{8000}$
4.	Map of Hyannis harbor and approaches	$\frac{1}{3000}$
5.	Long Island sound, sheet No. 1	$\frac{1}{8000}$
6.	Sachem's Head harbor, and Hart and City island harbor	$\frac{1}{6000}$
7.	Patapsco river and approaches	$\frac{1}{6000}$
8.	Map of Chesapeake bay	$\frac{1}{8000}$
9.	Map of the Pasquotank river	$\frac{1}{6000}$
10.	Map of Cat island harbor and Ship island harbor	$\frac{1}{4000}$
11.	The re-engraving of the lower sheet of the map of Delaware bay and river	$\frac{1}{8000}$

APPENDIX No. 3.

Report of Lieutenant Commanding Charles H. McBlair, United States navy, assistant in the coast survey, to the Superintendent, in relation to the discovery of four shoals in the main ship channel over the Nantucket shoals.

United States Surveying Steamer Bibb,
Wellfleet Bay, October 8, 1849.

Sir: I beg leave to report that we have recently discovered four shoals ying in what is known by the pilots as the "main ship channel over the Nantucket shoals."

They consist, as far as we have as yet been able to determine, of sharp nd abrupt ridges of fine white sand. Beginning at the most western hoal, and designating them numerically, as they lie east of each other, it may be stated that numbers 1 and 3 stretch in a northwesterly direction, he former being about one-fourth and the latter one-sixth of a mile long. The remaining two, designated by numbers 2 and 4, are very small spots, omewhat circular in shape.

The smallest soundings, reduced to mean low-water mark, show on No. 1 fourteen feet, on No. 2 fifteen feet, on No. 3 fourteen feet, and on No. 4 nine feet.

The bearings and distances of the shoalest spots on each, from points etermined on Nantucket island, are as follows:

No. 1, from Great Point light, N. 86° 30′ E. (true) distance 9.5 nautical miles.

No. 1, from Sankaty Head, N. 39° 58′ E. (true) distance 9.6 nautical miles.

No. 2, from Great Point light, N. 85° 40′ E. (true) distance 10.2 nautial miles.

No. 2, from Sankaty Head, N. 42° 18′ E. (true) distance 9.7 nautical miles.

No. 3, from Great Point light, N. 87° E. (true) distance 10.3 naucal miles.

No. 3, from Sankaty Head, N. 43° 55′ E. (true) distance 9.6 nautical miles.

No. 4, from Great Point light, N. 86° 45′ E. (true) distance 10.7 nautial miles.

No. 4, from Sankaty Head, N. 44° 50′ E. (true) distance 9.9 nautical miles.

These shoals can be readily discovered by the rip (or ripple) formed on hem by the tides, at all stages except during slack-water, when they can o longer be detected by this means, but in daylight they exhibit the usual iscoloration of water.

Besides the shoals already noticed, I subjoin the bearings and distances f two spots of small extent, on which we found 18 feet water at reduced oundings.

One bears from Great Point light N. 85° 40′ E. (true) distance 9.8 naucal miles; and from Sankaty Head, N. 40° 16′ E. (true) distance 9.4 autical miles. The other bears from Great Point light N. 85° 10′ E.

(true) distance 11.2 nautical miles, and from Sankaty Head N. 45° 25 E. (true) distance 10.5 nautical miles.

I am respectfully yours,

C. H. McBLAIR.

Professor A. D. Bache,
Superintendent U. S. Coast Survey.

APPENDIX No. 4.

Letter of the Superintendent of the coast survey to the Secretary of the Treasury on the detachment of Lieutenant Commanding Charles H. Davis, United States navy, from the work.

Coast Survey Station,
Near North Deerfield, N. H., July 17, 1849.

Sir: I have the honor to acknowledge the receipt of your letter of July 12, enclosing an order from the Hon. Secretary of the Navy, detaching Lieutenant Commanding Charles H. Davis from the coast survey, and charging him with the duty of preparing the Nautical Almanac. The order has been duly forwarded to Lieutenant Davis.

The official reports of the progress of the coast survey have, from time to time, brought the name and services of Lieutenant Davis very prominently before the department, as marked by all the qualities which insure distinction in such a work. The loss of his services will be deeply felt. The zeal, industry, knowledge, and judgment, ripened by experience, which he has brought to the survey, cannot soon be replaced. They have conferred upon it some of its most decided claims to usefulness and public approval.

In parting with this most valued officer for a field of duty alike honorable to him and useful to the country, I desire to place on the records of the Treasury Department the strongest expression of my sense of his merits in the career which he leaves.

I would respectfully request that a copy of this letter may be transmitted to the Navy Department.

Very respectfully yours,

A. D. BACHE,
Superintendent United States Coast Survey.

Hon. W. M. Meredith,
Secretary of the Treasury.

APPENDIX No. 5.

Report of Professor O. M. Mitchel, of Cincinnati, on the mechanica record of astronomical observations.

Cincinnati, *November* 10, 1849.

Sir: In accordance with your request, I have the honor to present to you the following report on the subject of the mechanical record of astronomical observations.

During the month of October, 1848, while engaged in company with S. C. Walker, esq., assistant United States coast survey, in observing r difference of longitude between Philadelphia and Cincinnati by the legraph, it was perceived that in this operation great advantage would gained, in case the Philadelphia clock could be made to record its eats in the Cincinnati observatory. Mr. Walker gave me to under-and that this problem had been discussed by yourself and others, and iat a mechanical solution had been proposed by Professor Bond, of the ambridge observatory, but had not been executed.*

On the afternoon of the 26th October, 1848, the subject was discussed y Mr. Walker and myself, in the presence of several gentlemen, who ere then assistants in the Cincinnati observatory, and in the United tates coast survey. After closing the conversations, I reflected on the most mple mechanical means by which the desired object might be effected, nd on the same evening executed the first rough plan which occurred me. The pendulum of a common brass clock was connected with ne pole of the battery, and at each vibration touched a small wire which as connected with the other pole of the same battery. At every such ontact a current passed and operated the recording pin of a Morse's egister, giving a dot for every alternate second on the running fillet.

This was the first rude contrivance, and in its application it mani-stly interfered with the rate of the clock. In case the spring was re-uced to sufficient delicacy to produce no sensible effect on the pendu-um, then the contact was not sufficiently firm to give a sure connexion.

Further reflection on the subject that night suggested to me another lan, which was executed the following morning. This second plan onsisted in attaching to the lower part of the pendulum a small wire, hich at each vibration, dipped into a cup of mercury, connected with he other pole of the battery. In this case, as in the former, the cur-ent passed through the pendulum of the clock. This was, however, y no means necessary to the plan, as the wire could readily be insu-ated, and the pendulum would then only be used as the moving power.

On presenting this plan to Mr. Walker, he expressed the opinion that ny interference with the pendulum would entail uncertainty on the rate f the clock; and hence it would become inapplicable in practice for the rdinary work of an observatory.

At that time the Cincinnati observatory had no astronomical clock, nd it was impossible to try the experiment. I was, however, satisfied hat in case the pendulum was taxed to either make or break the circuit, his could readily be made absolutely constant, and hence as good a ate could be given to the clock with this permanent fixture as without t. Subsequent experiment has demonstrated the truth of this opinion, s has been shown by Mr. Walker, as well as by my own experiments since the arrival of a new sidereal clock recently presented to the Cincinnati observatory.

After some difficulty I succeeded in obtaining the privilege of using for a short time a solar clock, the property of one of our citizens, and the evening of the 28th of October, 1848, was fixed upon for an experiment between Philadelphia and Cincinnati for difference of longitude by the new method. The morning of the day proved stormy, and the clock was not removed to the observatory.

Having organized a party for the preliminary surveys of the Ohio and

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* The drawings had been submitted to me, and approved, and the work was in the course of execution.—A. D. B.

Mississippi railroad on the first of November, I found it necessary to leave the observatory, and my experiments were broken off, and could not be resumed until the close of January, 1849. It was, however, agreed between Mr. Walker and myself that on the arrival of the sidereal clock then ordered, we would resume the experiments and work between Philadelphia and Cincinnati.

A few experiments made before leaving the observatory in October, 1848, on the uniformity with which the Morse fillet could be delivered, showed great irregularity of motion, and convinced me that it would be inapplicable to the requirements of astronomy. One hundred seconds recorded on the fillet were never equal to any other hundred seconds, hence the second spaces were of unequal length, and any fixed scale for their measurement would be impossible.

My present method of recording right ascensions was communicated by letter to you under date of the 5th February, 1849. The machinery was not finished until some seven or eight weeks after that date, in consequence of my absence from the observatory.

I shall now proceed to describe this machinery, and that subsequently invented for the record of declinations, in as few words as possible.

Any machinery to be useful in the record of right ascensions, must fulfil the following conditions, viz:

1. The record of time and observations must be accurately, distinctly, and perspicuously made.
2. The machinery must be simple, easily adjusted, not liable to the effects of atmospheric changes.
3. The record must be simple, easily read, and condensed within a narrow and convenient compass.

To accomplish the fulfilment of these conditions, I conceived the following mechanical contrivance:

1. A horizontal disk is caused to revolve on a vertical axis with uniform velocity.
2. This disk carries either a metal plate or a paper disk, on which the time and observations are recorded by pens drawn by electro-magnets.
3. The time pen is operated by the sidereal clock, by attaching a delicate cruci-form lever to the pendulum by a spider's web. This lever at every alternate second dips into a cup of mercury, forms the connexion, and a second's dot is struck by the time pen on the paper or metallic disk revolving beneath the pen.
4. The pen for recording observations is under the control of the observer at the instrument, who records his observations by simply touching a key, which, by mercurial connexions, forms the circuit, and operates the observation pen.
5. When the disk performs one revolution, it trips on a railway, and is thrown forward the tenth of an inch by self-acting machinery, when a new circumference of time dots is commenced.

In the use of this machinery we commence by adjusting the disk to revolve once in every sixty seconds. This is usually accomplished in five or six minutes. It is then adjusted to trip between the 59th and 0 second of every minute. This adjustment occupies about three minutes. These being completed, the 0 second of every minute falls in a right line radiating from the centre of the disk. The 2d, 4th, 6th, &c., seconds radiate in right lines in like manner.

Noting on the face of the disk any hour and minute, and second, from e face of the clock, the entire disk presents a perfect circular time scale, as sily read as a table of logarithms, or other tables arranged in horizontal d vertical columns.

The observations dots fall intermediate between the minute circles and cond dots, and are struck so as to distinguish them by form from the me dots.

Having closed all the mechanical arrangements for observing in R. A., introduced a new diaphragm containing 25 wires, arranged in groups of *ven*, by making the *seventh*, the *thirteenth*, and *nineteenth* wires a little nger than the others. As many as *fifty* wires have been used, but for dinary observing the number has been fixed at twenty-five. The disk as now been in use for several months, and is found to be very controlble and convenient; its adjustments are rapidly made, and the uniformy of its motion is such as to give a record of time far more accurate than y observations can be made.

The time and observation pens are so constructed that they cannot rest pon the disk any sensible time. By making the magnetic connexion for er so long a time, nothing but a minute round dot can be made.

By this machinery we are enable to observe with an accuracy in which e actual errors on any one wire struck and recorded are but one-half the average Greenwich errors on one wire. Hence *one* wire by the ew method becomes equal in weight to four Greenwich wires, and a 25-ire new observation is equal to about 15 of the seven-wire observations, made at Greenwich. This refers to average work as already done at e Cincinnati observatory. Should experience enable us to equal our est work, our errors would be only one-fourth of the Greenwich errors, nd the above motion would be greatly increased in favor of the new ethods.

We are now able to observe *double stars*, in which the diff. in R. A. exeeds half a second of time with astonishing accuracy. Among other ars we have observed β^1 and β^2 Lyræ, 61 Cygni, and β Cephei.

We find by an examination of the intervals of the wires, as determined y double stars and by single star observations, that our work in double tars is not quite so accurate as that involving only one object; and yet, from bservations of the former kind, our mean difference from the mean, show probable error of any one mean diff. of R. A. not to exceed *five thouandths* of one second of time, as deduced from 25-wire observations.

I now proceed to give some account of the mechanical means for recordg *differences of declination.*

Soon after my attention was directed to the examination of the subject f a mechanical record of R. A., I conceived a method of recording delinations; but being unwilling to divide my attention, this plan was not xecuted until the beginning of August, 1849.

I have attached to the axis of the transit or equatorial, by a strong lamp-collar, an arm, which (as now in use) is about 6 feet in length. To this arm such a form is given as to avoid, as far as possible, any senible flexure from a position out of the vertical. To the upper part of his arm an electro-magnet is fixed, which operates a double lever, armed with a steel recording pen. To receive the record, a metallic plate is laced vertically on the face of the transit pier, moving in ways parallel o the circles described by the recording pen. To use this instrument for record, the observer sets for his standard star; the arm is then brought t the vertical and clamped. The instrument is then clamped, and a tangen screw gives to the observer his slow motion for bringing the star to th declination wires. When the star is bisected, the observer strikes th key with his finger, the circuit is formed, the electro-magnet brings th pen in contact with the record plate, and, while in contact, the plat descends in its ways, and a zero line is described on the plate, fro which all differences of declination are afterwards read. At present w use three declination wires, and there are three zero lines obtained fro the standard star. The number may be increased up to *five*, or even *ten* if desired; and in this way almost any number of declinations may b obtained during one and the same transit. When the difference of decl nation of one star has been recorded, the plate moves upward about th tenth of an inch, and is ready for the next record.

It will be seen that we are now recording a declination on a circle nearly *twelve feet in diameter.* This may be increased to *forty* feet, desirable. The only source of sensible error yet perceived in this metho arrives from possible flexure. This may readily be ascertained, by ob serving the same stars with the arm vertically *down* and vertically *up* The first set of differences will be too short, the second will be too lon by the error of flexure. Their difference will be the double error. N sensible value has yet been obtained. The arm, as now used, neve leaves the vertical more than 5° of arc; and its form is such as to secur it from sensible flexure absolutely within such limits.

To read the records of R. A. and declination, certain machinery ha been constructed. The R. A. is read by a sector, composed of two legs revolving on a pivot, one of which bears an arc divided to read to hun dredths of a second of time.

To read the record of declination, the plate is laid on a carriage an levelled by four screws: a movable arc, divided into equal parts, whos values have been absolutely determined and tabulated, is adjusted so tha its 0 coincides with the zero line of the record. It then glides on it ways parallel to and just above the record plate. A micrometer scre and microscope, with a spider's web, reads the fractions of the equal part into which the arc is divided, with great facility and with great accuracy In applying this machinery to the purpose of cataloguing, all light i dispensed with, and the wires usually employed are superseded by *occult ing bars.* The R. A. is taken by ingress and egress, while the star is bi sected by the edge of the horizontal occulting bar for declination.

The system of record is the following:

The observer fixes the width of his zone in proportion to the numbe of stars in the region under examination. An assistant records on th catalogue the number of the star and its magnitude as called out by th observer. The stars are recorded in R. A. on the disk, and in declinatio on the sliding plate. The standard stars are readily distinguished a their R. A. and declination are known, and the differences of R. A. an declination are read off with great facility from the two records.

Such is the rapidity with which this work may be executed, that, i an experiment made on the evening of the ———, I recorded, in twent minutes of time, no less than *one hundred and three* stars. The R. A was observed on a single occulting bar, while the declination was care fully taken on the horizontal bar. I feel confident that the R. A. in n stance was out more than three-tenths of a second of time, while the clinations were as well observed as is usually done by the old methods.

I am delayed from commencing actual work in cataloguing, by not havg yet received my instrument for measuring up differences of declinaon. Thus far, I have used the micrometer of the equatorial, which nly furnishes relative and not absolute results. In a few days the inrument is to be finished, and, as soon as received, I will communicate pecimens of the work.

I find my disk and its appliances of signal value in the investigation of e problem of wave-time in electrical currents. I have performed a series experiments on the following plan, which yield some very interesting sults:

Two pens, with steel points, are so placed as to strike minute dots on a etal plate revolving beneath them on the disk. The sidereal clock is onnected with the two local batteries driving these pens, so that the ock beats are recorded at the same absolute movement by the two local rcuits. One of these pens is not changed, but remains ever in the me condition, driven by a short circuit; while the other can be placed pleasure under the power of a circuit extending to Pittsburg and back, ong the wires, a distance of 603 miles.

It was soon discovered that the adjustment of the receiving magnet xercised an important influence on the pen operated by the circuit closed y the receiving magnet. When the armature came up firmly, the pen as brought down quick; while a feeble movement of the armature aused delay in the pen, amounting to a tenth of a second, or even more. ence it became important to adjust in such manner as to obtain equality the force of the long and short circuits driving alternately the *variable* en.

When this was done, the alternations were made from *short* to *long* ciruits; and in case the long circuit produced any delay, it could not be etected by the ear. This was decided by the following experiment:

The persons who changed the circuits agreed among themselves as to e order of their changes. Those listening knew nothing of their private greement, so that the judgment was unbiased. After five minutes of ial, the operators asked what changes, if any, had been made. No one ould answer, and all believed that no changes had been made; while, in eality, the changes had been effected every *ten seconds* during the whole xperiment.

In case the ear can detect differences of time equal to one-hundredth of second—which, from my own experiments, is certain—then the velocity f the wave cannot be less than sixty thousand miles per second. In ase the ear can detect differences of time amounting to half a hundredth, hen the limit cannot fall below one hundred and twenty thousand miles er second.

I soon discovered that the force of the electric current was subject to erpetual change of a minute character, but not to be neglected in so deliate an investigation.

This was exhibited in the armature time, as recorded by the pen, caried by an elastic handle.

Whether the changes of armature time are entirely due to changes in he current, or to differences of connexion, remains to be determined. hey are, probably, dependant on both causes.

It now became necessary to cause both pens to record their armatur time, and, by increasing or decreasing the local battery of the variabl pen, to bring the force of the long and short circuits to as near an equalit as possible.

This last experiment will be recorded on the metallic disk, and will b printed for distribution. It has been delayed by a break in the line; an as the limit in time for this report has come round, I send it unfinished

Respectfully, your obedient servant,

O. M. MITCHEL.

Dr. A. D. Bache,
Superintendent U. S. Coast Survey.

APPENDIX No. 6.

Report of Lieutenant Commanding Charles H. Davis, United State navy, assistant in the coast survey, to the Superintendent, on the deter mination of the position of Cashe's ledge, off the coast of New Englanc

United States Steamer Bibb,
Boston, June 8, 1849.

Dear Sir: I have the pleasure to inform you that on Monday the 4t instant I sailed from Boston, to execute that part of my instructions re lating to the rock in Cashe's ledge, and that I have found it and deter mined its position satisfactorily.

The Bibb remained at anchor on the rock from 5 o'clock on Tuesda to 5 o'clock on Wednesday afternoon, during which time the boats wer employed in making examinations of the surface of the rock. The se was smooth, the wind west, the weather perfectly clear, and the souther and western horizons well defined.

The latitude was determined—

First. By the meridian altitude of the moon with three observers whose readings differed from each other less than half a minute. Th meridian passage occurred at twelve minutes past midnight. The decl nation of the moon was 17¾° south, which, the night being remarkabl cloudless, secured a distinct horizon.

Second. By a meridian observation of the sun with four sextants, th readings of which differed in the extreme but one minute.

The latitudes given by the sun and moon differ from each other bu one mile.

The longitude was determined by three chronometers from Messrs Bond & Son, which were taken on board on Monday and returned o Thursday, and were proved by the final comparison of Thursday to hav run correctly. Twenty-five observations, taken on the 5th and 6th, wer used to ascertain this element. The mean of those of the 5th differe from that of those of the 6th by only a second of time. Several sets, no employed in obtaining the reported result, were also taken for confirma tion: not being absolutely required, they were worked out with less care

The latitude of the rock is 42° 56′.

The longitude, the mean of both days' determinations, is 68° 51½′.

The latitude and longitude of this rock recently given by the bes

uthorities are 42° 44′ and 69° 03′, differing 12 miles from the coast
urvey determination. Formerly the latitude and longitude of this spot
ere laid down as 43° 04′ and 69° 11′, the former 8 and the latter 20
iles in error. These errors, particularly in latitude, give additional
alue to our determination, and render its early announcement import-
nt to navigators.

The least water on this rock is twenty-six (26) feet. A less depth has
een reported by the fishermen; but they sound with their fishing lines,
ot accurately marked, and having on them a lead of three and a half
ounds only—not heavy enough to press down or pass through the
ick kelp that covers the rock. The extent of rock having ten or less
thoms on it, is about half a mile in a NW. by W. and SE. by E. direc-
on, and very narrow. It is surrounded by deep water at a short dis-
nce, particularly on the southeast side, where the depth increases sud-
enly to sixty fathoms.

It is my wish that this should be called Ammen's rock, in compli-
ent to the officer by whose exertions last summer the means were af-
rded for discovering and correctly determining its position at this time.

Yours, truly,

CHARLES HENRY DAVIS.

A. D. Bache, LL. D.,
Superintendent U. S. Coast Survey, Washington.

APPENDIX No. 7.

etter from the hydrographer to the Admiralty Board to the Superintendent of the coast survey, in relation to Cashe's ledge.

London Admiralty, *July* 13, 1849.

Sir: I have to acknowledge the receipt of your letter of June 18, en-
osing the correct position of Cashe's ledge, as determined by Lieuten-
nt Commanding Davis; and I beg that you will accept of my warmest
anks for your kindness.

The only return I can at present make is an account of a rock that
as recently been discovered off the eastern coast of Patagonia, and
hich may be interesting to you, from the prodigious number of United
tates vessels that go round Cape Horn.

In general, it appears to me imprudent to change long established
ames; but out of deference to the distinctly expressed wish of Lieu-
nant Commanding Davis, I shall adopt that of Ammen's rock for the
oal spot on the ledge, in all our charts.

I have the honor to be, sir, your very humble servant,

F. BEAUFORT.

Professor A. D. Bache, *&c., &c.*

APPENDIX No. 8.

Report of Lieutenant Commanding J. R. Goldsborough, United State navy, assistant coast survey, of the circumstances of the rescue of thre persons from a vessel capsized in a squall of wind, October 24, in th Vineyard sound.

United States Schooner Nautilus,
Wood's Hole, October 25, 1849.

Sir: It becomes my pleasing duty to report to you the noble and generous conduct of Acting Master E. C. Stout, Passed Midshipman D. P McCorkle, and the crews of the cutter and whaleboat belonging to thi vessel, in the following instance:

Late in the evening of the 24th instant, it being quite dark, the win blowing a gale from the northward and westward, intelligence reached m from our tidal observer at Nobska light, through Mr. Fish of this place that a sloop, in beating through the Vineyard sound, had been suddenl struck by a heavy squall of wind and capsized. I immediately despatche Acting Master E. C. Stout in the cutter, and Passed Midshipman D. P McCorkle in the whaleboat, to her assistance. Upon reaching her the discovered she had drifted ashore upon the middle reef in the sound, th sea making a heavy breach over her, and her captain and crew lashe upon her side and bottom. The whaleboat under Passed Midshipma McCorkle happened to reach her first, and succeeded in rescuing (no without great effort and risk to himself and crew) the lives of the unfortunate persons upon her—three in number. She proved to be the Moun Prospect, of Falmouth, bound to this place. One of the persons on boar was Mr. Bourn, postmaster of Wood's Hole.

I take great pleasure in bringing to your notice the spirited and meritorious conduct of these officers, together with the crews of the cutter an whaleboat of this vessel; by their timely aid, in all probability, a melancholy loss of life was prevented.

I am, very respectfully, your obedient servant,

J. R. GOLDSBOROUGH,
Lieutenant Commanding, United States Navy.

A. D. Bache, LL. D.,
Superintendent U. S. Coast Survey, Portland, Maine.

APPENDIX No. 9.

Letter from Elam Alexander, esq., president of the Washington an New Orleans telegraph line, giving free use to the coast survey of th telegraph line for astronomical observations to S. C. Walker, esq assistant United States coast survey.

Washington, *July* 12, 1849.

Sir: Your communication to D. Griffin, esq., late president of th Washington and New Orleans company, has been referred to me f reply.

With every wish to promote your labors, I cheerfully acquiesce in you quest, that a line be run from our office in Charleston to the Charleston servatory, the patentees having first granted their right for the erection said line.

And, further, the line may be used for astronomical observations, transtted at night, provided the operators are rewarded for this extra service the board of the coast survey.

With great respect, your obedient servant,

ELAM ALEXANDER,

President of the Washington and N. Orleans Tel. Co.

Sears C. Walker, Esq.,

Office of the Coast Survey, Washington.

Seaton Station,

Washington, D. C., July 15, 1849.

Dear Sir: Your esteemed favor of the 12th instant is received, and privileges granted by it to the Seaton station of the coast survey are tefully accepted.

Your example will doubtless be followed by other telegraph companies; it gives me pleasure to acknowledge yourself as the leader in this ral course for the encouragement of science.

Yours truly and respectfully,

SEARS C. WALKER,

Assistant U. S. C. S., in charge of the Seaton Station.

To Elam Alexander, Esq.,

President of the N. O. Telegraph Company,

Macon, Georgia.

APPENDIX No. 10.

Extract from the report of Lieutenant Commanding Richard Bache, United States navy, assistant United States coast survey, showing the cost of different kinds of work executed by him in the steamer Legaré, 1848, (in-shore work.)

Date.	Wind and weather.	No. of hours' steaming.	Miles of soundings.	Coal consumed.	Wood consumed.	Oil consumed.	Tallow consumed.	Total cost of steaming.
				Lbs.	*Feet.*	*Galls.*	*Lbs.*	
May 23	Light southeast; hazy - -	5.25	–	3255	32	1.50		
24	Light southeast; foggy - -	7.00	–	3255	–	1.50		
25	Light southeast; hazy - -	11.00	–	3627	32	1.50	1.0	
26	Light variable; hazy - -	4.00	–	1340	–	1.00	1.0	
27	Light variable; clear - -	12.00	36.0	3069	–	2.00	1.0	
28	Light variable; clear - -	13.00	25.5	2630	–	2.00	1.0	
29	Light southward and eastward; clear	12.00	45.5	4536	–	2.00	1.0	
31	Fresh northward and westward; passing clouds - - - -	3.30	6.5	4711	–	2.00	1.0	
June 1	Gales, northward and westward; cloudy - - - -	3.00	9.5	850	–	1.00	1.0	
2	Light northward and westward; passing clouds - - - -	12.15	39.5	3720	–	2.00	1.0	
3	Fresh southward and westward; clear	10.15	14.0	3441	–	2.00	1.0	
4	Light northward and eastward; clear	13.00	24.0	3348	–	1.50	0.5	
5	Light variable; foggy - -	1.30	–	1302	–	0.50		
6	Moderate northward and westward; cloudy - - - -	10.00	–	3255	–	1.00	0.5	
7	Fresh northward and westward; clear	14.00	48.0	4557	–	1.50		
8	Light variable; rainy - -	12.30	28.0	3069	–	1.50	0.5	
9	Fresh northward; rainy - -	14.15	36.5	4464	–	1.50		
10	Moderate, variable; cloudy - -	17.00	20.0	6975	–	2.00	1.0	
Sept. 4	Moderate northward and westward; passing clouds - - -	12.00	30.5	3720	–	2.00		
5	Light northward and westward; clear	12.00	33.5	4815	–	3.00	2.0	
6	Moderate northward and westward; clear - - - -	14.30	35.0	4371	–	1.50	2.0	
7	Moderate northward and westward; clear - - - -	13.30	47.0	4743	–	2.00	2.0	
8	Light variable; clear - - -	14.00	31.5	5115	–	2.00	2.0	
9	Light southward and westward; passing clouds - - - -	19.00	33.5	7626	–	2.50	2.0	
10	Light westward; clear - -	5.30	–	3800	–	1.00	1.0	
		264.50	544.0	95594	64	42.00	22.5	
				Dolls. 204.84	*Dols* 2.25	*Dolls.* 52.50	*Dols* 1.80	$261 3
	Per hour - - - - -	–	*Miles.* 2.05	*Lbs.* 361.4 *Cts.* 77.4	*Feet.* 0.24 *Cts.* 0.8	*Galls* 0.16 *Cts.* 19.9	*Lbs* 0.08 *Cts.* 0.7	*Cts.* 107.

The cost per mile is 48 cents.

Most of these soundings could not have been made in a sailing vessel at the time the work wa executed in the "Legaré."

At least one-fourth more miles were run than appear in the above table, in landing and takin off officers, erecting signals, &c.

The fires were never allowed to go out at any time.

The vessel always anchored at night, with two exceptions.

APPENDIX No. 10—Continued.

Off-shore soundings.—Expenses of steamer "Legaré," 1848.

ate.	Wind and weather.	No. of hours' steaming.	Miles of soundings.	Coal consumed.	Wood consumed.	Tallow consumed.	Oil consumed.	Total cost of steaming.
				Lbs.	*Feet.*	*Lbs.*	*Galls.*	
ne 27	Light southward; foggy	14.0	33.5	5115	-	0.5	1.0	
28	Fresh southward; clear	24.0	30.0	9300	-	2.5	2.5	
g. 7	Moderate northward and eastward; clear	12.0	47.0	6968	-	1.0	2.0	
8	Moderate northward and eastward; clear	24.0	136.5	3255	-	-	1.5	
9	Light southward and westward; foggy	19.0	58.0	8379	-	-	1.5	
23	Moderate southward and eastward; clear	20.0	22.0	4650	30	2.0	1.5	
24	Light eastward; clear	24.0	91.0	4650	-	1.0	2.0	
25	Moderate northward and eastward; clear	16.0	45.5	5394	-	1.0	2.0	
31	Light southward; clear	15.0	57.0	6510	31	2.0	2.5	
t. 1	Moderate southward and westward; passing clouds	24.0	93.0	8091	-	3.0	2.5	
2	Moderate westward; clear	24.0	121.0	6975	-	2.0	2.0	
		216.0	734.5	69287	61	15.0	21.0	
				Dolls. 165.60	*Dols* 2.20	*Dols* 1.20	*Dolls.* 26.25	$195 25
Per hour		-	*Miles.* 3.40	*Lbs.* 320.8	*Feet.* 0.3	*Lbs.* 0.07	*Gall.* 0.10	*Cts.* 90.4
				Cts. 76.6	*Cts.* 01.0	*Cts.* 00.5	*Cts.* 12.1	

he cost per mile is 26½ cents.
hese lines of soundings were nearly all run against the wind.

APPENDIX No. 10—Continued.

Work executed in the Gulf stream—Sections II and IV.—Expenses of steamer "Legaré," 1848.

Date.	Wind and weather.	No. of hours' steaming.	Miles run.	Coal consumed.	Tallow consumed.	Wood consumed.	Oil consumed.	Positions occupied.	Total cost of steaming.
					Lbs.	*Feet*	*Galls.*		
July 3	Moderate westerly; clear - -	19	–	3255	–	30	0.25		
4	Moderate westerly; clear - -	24	110.0	7440	1.0	–	2.00		
5	Light southerly; cloudy - -	24	57.5	5301	1.0	–	1.50	3	
6	Moderate westerly; cloudy -	24	63.5	6000	1.0	–	2.00	1	
7	Fresh variable; squally - -	24	62.0	6968	1.0	–	2.00		
8	Calm; variable; rainy - -	24	60.0	3255	-	–	1.50		
9	Light westerly; cloudy - -	24	42.5	8379	–	–	1.50	2	
10	Light southward and eastward; clear	24	74.0	10230	1.0	–	2.00	1	
11	Moderate southward and eastward; clear - - - - - -	24	64.0	8000	1.0	–	2.00	2	
12	Moderate southward and eastward; clear - - - - -	24	75.0	7500	2.0	–	2.00	1	
13	Moderate southward and eastward; clear - - - - -	24	74.0	6789	1.0	–	0.75	1	
14	Light southward; clear - -	24	57.0	3255	–	15	0.25	1	
15	Light southward and westward; passing clouds - - -	24	61.0	760	–	–	–	1	
16	Moderate southward and westward; clear - - - - -	24	70.5	600	1.0	10	1.50		
17	Light southward and westward; clear	24	77.0	7000	1.0	10	2.00	1	
18	Moderate southward and westward; cloudy - - - - -	24	86.0	6500	–	10	0.25	2	
19	Moderate southward; fresh gales -	24	71.5	2230	–	–	1.00		
20	Moderate southward and westward; clear - - - - -	24	71.5	3720	–	–	1.50		
21	Light southward and westward; clear	24	90.0	6700	–	14	2.50	2	
22	Light southward; clear - -	24	92 0	3780	–	–	1.75	1	
23	Fresh southward; rain - -	24	60.5	5115	–	15	1.50	3	
24	Squalls, southward and westward; rain - - - - -	24	70.0	6800	–	128	1.50		
25	Light southward and westward; clear	24	62.0	5859	–	–	2.00	3	
26	Light variable; clear - -	24	98.5	7626					
		571	1650.0	133062	11.0	232	33.25	25	
				Dolls. 319.00	*Dols* 0.88	*Dols* 7.87	*Dolls.* 41.56		$369 31
	Per hour - - -	–	*Miles.* 2.89	*Lbs.* 233.0	*Lbs.* 0.02	*Feet* 0.40	*Galls.* 0.06		*Cts.* 64.8
				Cts. 55.9	*Cts.* 0.15	*Cts.* 01.4	*Cts.* 07.28		

Cost of articles consumed.—Coal per ton, $4 80; wood per cord, $4 50; oil per gallon, $1 25; tallow per pound, 8 cents.

Cost per mile is 22½ cents.

This work could not have been done in nearly the same time in a sailing vessel; the power of this vessel being insufficient to propel her in a direct course against the winds. The only advantage secured was in keeping the line perpendicular and reeling it up by steam. The fires were at all times kept up, and sail was used when the wind allowed.

APPENDIX No. 10—Continued.

Extract from report of Lieutenant Commanding S. P. Lee, United States navy, assistant United States coast survey, to the Superintendent, stating the expenditures for coal, oil, tallow, and wood, while surveying in the steamer Legaré, in 1849.

Date.	No. of hours' steaming.	Coal consumed.	Cost of coal.	Oil consumed.	Cost of oil.	Tallow used.	Cost of tallow.	Wood consumed.	Cost of wood.	Cost of steaming per hour.
		Pounds.	*Dolls.*	*Galls.*	*Dolls.*	*Lbs.*	*Cents.*	*Sticks.*	*Cents.*	*Cents.*
June 18	12.66	3410	6.00	1.50	1.97	7	70	40	116	77.6
25	6.00	1900	2.50	1.25	1.56	-	-	-	-	67.7
26	15.00	5254	9.94	1.25	1.56	-	-	-	-	76.7
27	13.00	4666	9.33	1.25	1.56	-	-	-	-	83.8
28	11.00	4658	9.30	1.50	1.97	-	-	-	-	102.5
29	9.00	4705	9.40	0.50	0.62½	-	-	-	-	111.4
July 3	10.00	4748	9.35	1.50	1.75	-	-	-	-	111.0
5	12.00	5256	9.85	1.75	2.18	-	-	-	-	102.0
13	10.00	2620	5.09	1.25	1.56	-	-	6	12½	67.7
17	5.00	2179	4.20	0.25	0.31	-	-	40	30	96.2
18	13.00	4875	9.41	2.00	2.50	-	-	12	20	93.1
19	14.00	5052	9.63	2.00	2.50	-	-	12	20	88.1
25	6.00	2351	4.50	0.50	0.62	-	-	-	-	85.3
28	8.00	3979	7.64	1.50	1.97	-	-	-	-	120.1
30	10.50	4782	9.20	2.00	2.50	-	-	44	30	114.3
31	15.00	7204	14.00	1.75	2.18	-	-	12	06¼	108.3
Aug. 2	5.00	3171	6.48	1.00	1.25	-	-	12	06¼	155.8
16	3.00	1448	2.79	0.50	0.62½	-	-	-	-	113.7
17	10.00	5395	10.50	1.50	1.97	-	-	8	06¼	125.3
30	11.75	4923	9.66	1.50	1.97	-	-	-	-	99.0
31	12.50	7659	14.50	1.75	2.18	-	-	-	-	133.4
Sept. 6	13.00	7004	13.46	2.00	2.50	6	60	-	-	127.4
7	5.00	3575	6.88	1.00	1.25	4	40	-	-	169.6
8	3.00	2875	4.75	1.25	1.56	4	40	-	-	220.0
12	8.50	5635	10.82	1.00	1.25	6	60	-	-	149.0
15	13.00	6577	12.80	3.00	3.75	4	40	-	-	130.4
17	12.00	8475	14.40	3.00	3.75	4	40	-	-	154.6
22	12.25	6500	12.80	2.50	3.12	3	30	-	-	132.4
24	8.00	6015	11.76	2.00	2.50	2	20	-	-	180.8
25	13.00	7585	19.50	2.00	2.50	3	30	-	-	171.5
	300.16	144476	280.44	45.75	57.49	43	430	186	247	3568.7
		Pounds.	*Cents.*	*Galls.*	*Cents.*	*Lbs.*	*Cents.*	*Sticks*	*Cents.*	*Cents.*
Per hour -		481.3	93.4	00.15	19.2	00.14	01.4	00.6	00.9	118.9

Counting only the actual miles in lines of soundings run, as measured from the sounding sheet, the cost per mile is forty-seven and a half cents. But from this should be deducted fifteen per cent. for extra expenditure, owing to the bad state of the condenser.

If the miles of running done while communicating with stations, making an offing at night or an anchorage, and taking up position next day, were included in this estimate, the cost per mile would be largely diminished.

APPENDIX No. 10—Continued.

Recapitulation of the foregoing, showing the expense per mile, and al the expense per day, of different kinds of hydrographical work, as exec cuted in the steamer "Legaré," 1848 *and* 1849.

Date.	The kind of work executed.	Expense.	Expense.
1848..............	In-shore....................	Per mile..$0 48	Per day....$10
1848..............	Off-shore....................	Per mile.. 26½	Per day.... 17
1848..............	Gulf stream................	Per mile.. 22½	Per day.... 15
1849..............	In-shore....................	Per mile.. 47½	Per day.... 11

Exclusive of cost of repairs.

APPENDIX No. 11.

Extract from a letter to Professor A. D. Bache from W. M. Boyce, esq., assistant United States coast survey.

Schooner Bancroft,
Near S. Base, Bodie's Island, N. C., January 31, 1849.

Dear Sir: * * * * * There is no material change in the inlet since you left here. The channel out over the bar, which was close around the north shore when you saw it, now runs directly out and seems to be working south. I have sounded it carefully, and the least depth on the bar was 7½ feet, falling off suddenly both inside and out, into two fathoms. Following the channel into the sound, at about 1½ mile from the inlet, there is a bulkhead, upon which, at ordinary high water, there is four feet, crossing which the Old House channel is entered with six feet, which can be carried through to the sound, gradually deepening as you approach it. Upon the whole the water rather increases, and, with such weather as we have had during the present month, must continue to deepen. With southwardly winds the sound is higher than the mean height of the sea, and lower during the prevalence of northwardly gales, causing a very strong current to set through the inlet. My boat, with four good oarsmen, cannot make the least headway against it at a mile and a half from the inlet at such times; and the current increases as you approach the inlet. I think a long continuance of moderate easterly winds would do more towards closing it than any other state of weather, by throwing up a bar at its mouth. * * * * * *

Truly yours,

W. M. BOYCE.

APPENDIX No. 12.

Letter of J. W. Page, Merry Hill, Bertie county, North Carolina, to the Superintendent United States coast survey, relating to a memorandum found in a bottle on the coast of North Carolina, thrown from the coast surveying steamer Jefferson.

Merry Hill, Bertie County,
North Carolina, September 24, 1849.

Dear Sir: I found the enclosed survey data in the possession of a native "banker boy," on the sand-hills of the Carolina coast. I forward it to your direction, agreeable to the request contained therein.

I will state, as perchance in the furtherance of your object, that it was picked up at noon, September 22d, on the beach at Nag's Head, Currituck county, twelve or fifteen miles north of the new light-house at Roanoke inlet. It was picked up opposite the residences of the summer visiters at that place, whose notice it could not long have escaped, as of the five or six hundred visiters a greater or less number are on the beach or bathing at all hours of the day.

The wind from the 10th to the 22d was almost invariably from northeast and east.

With the highest respect, your obedient servant,

J. W. PAGE.

Professor A. D. Bache.

United States surveying steamer Jefferson, Thornton A. Jenkins, lieutenant commanding, Thomas G. Corbin, master; September 10, at noon.

Latitude observed 37° 48′ 42″ N.
Longitude 72° 39′ 20″ W. (chro.)
Soundings $\frac{0}{270}$.

The person who finds the bottle containing this notice, will confer favor upon seafaring men by forwarding the notice, unmutilated, to A. D Bache, superintendent United States coast survey, Washington city.

APPENDIX No. 13.

Report of Lieutenant Commanding J. N. Maffitt, U. S. N., assistant i the coast survey, to the Superintendent, in relation to a light-house a Bull's bay, on the coast of South Carolina.

Sir: I respectfully recommend the erection of a light-house on th northeast bluff of Bull's island, that this harbor of refuge may be useful t navigators when caught in this vicinity during the night.

I propose an inferior light, that could not be confounded with Charlesto light, which is, however, (when seven miles off) easily denoted by fiv beacons, for crossing the bar at night; and in making "Bull's Bay" revolving light, "Cape Roman," a "fixed red light," would be distinctl seen on the starboard hand in approaching and entering.

The advantage of this harbor is obvious, as vessels bound to the northward, and caught in a northeast gale, can find shelter, instead of bein driven out of their course, while making an offing to the sound.

Again, vessels bound to Charleston and caught in the vicinity of cap Roman, with heavy weather from the northward and eastward, eastward and southward and eastward, could here anchor in safety, as it impossibl to cross the bar at Charleston with the wind heavy from the direction last named, and to make an offing would generally drive them a numbe of days from their destination before the weather became favorable.

Respectfully, your obedient servant,

J. N. MAFFITT,
Lieut. Comd'g, and assistant U. S. Coast Survey.

To Professor A. D. Bache,
Superintendent U. S. Coast Survey, Portland, Maine.

APPENDIX No. 14.

Extract from the annual registers of marine disasters on the Florida reef. (Received from Assistant F. H. Gerdes, United States coast survey.)

Year.	Salvage paid.	Repairs at Key West.	Value of vessel and cargo.
844	$92,712 19	$76,352 10	$725,000 00
845	69,591 99	36,115 52	737,000 00
846	123,892 00	107,531 00	1,597,300 00
847	50,626 00	80,917 62	525,000 00
848	125,800 00	200,000 00	1,282,000 00
	461,622 18	500,916 24	4,866,300 00
Average one year	92,324 44	100,183 25	973,260 00

Number of vessels wrecked in 1844	29
Number of vessels wrecked in 1845	26
Number of vessels wrecked in 1846	58
Number of vessels wrecked in 1847	20
Number of vessels wrecked in 1848	41
Number of vessels wrecked in five years	174
Average one year	35

APPENDIX No. 15.—*Tabular statement of the losses and damages which occurred in the years 1844 to 1848 at the Florida reef, designating the different localities and damages on each, by F. H. Gerdes, assistant United States coast survey.*

Shoals.	Number of vessels.	1844.—Loss.	Number of vessels.	1845.—Loss.	Number of vessels.	1846.—Loss.	Number of vessels.	1847.—Loss.	Number of vessels.	1848.—Loss.	Total No. vessels.	Amount of loss.
Key West	-	-	-	-	27	$54,130 00	-	-	-	-	27	$54,130 00
Carysfort	5	$18,889 68	4	$55,314 47	4	54,562 83	3	$38,700 00	1	$6,000 00	17	168,066 98
Tortugas	5	25,596 67	5	13,048 17	1	4,000 00	2	8,000 00	2	9,100 00	15	59,744 84
Cape Florida	-	-	-	-	1	100 00	1	4,680 00	4	43,000 00	6	47,780 00
Alligator Reef	-	-	-	-	4	25,836 00	-	-	1	14,400 00	5	40,236 00
Key Vacas	1	9,104 59	-	-	2	4,090 00	-	-	2	26,200 00	5	39,394 59
Quicksands	1	2,749 77	2	4,144 73	1	100 00	-	-	-	-	4	6,994 50
Dry Rocks	1	1,187 94	-	-	2	1,544 45	-	-	1	8,500 00	4	11,232 39
Sombreras	-	-	3	14,823 39	1	9,000 00	-	-	-	-	4	23,823 39
Sand Key	-	-	-	-	-	-	1	14,700 00	3	2,540 00	4	17,240 00
American Shoal	1	3,349 69	-	-	-	-	-	-	1	1,600 00	2	4,949 69
Sambos	-	-	1	87 50	-	-	1	2,000 00	-	-	2	2,087 50
Pickle Reef	-	-	1	5,965 76	-	-	-	-	1	19,500 00	2	25,465 76
Couch Reef	-	-	-	-	1	3,094 00	1	-	-	-	2	3,094 00
Love Key	-	-	-	-	1	5,400 00	-	-	1	890 00	2	6,290 00
N. Found Harbor	-	-	-	-	-	-	1	634 00	1	950 00	2	1,584 00
Rugged Rocks	-	-	-	-	-	-	-	-	2	12,400 00	2	12,400 00
Cape Antonio	1	1,045 24	-	-	-	-	-	-	-	-	1	1,045 24
Long Key	1	27,809 93	-	-	-	-	-	-	-	-	1	27,809 93
Key Largo	1	18,711 59	-	-	-	-	-	-	-	-	1	18,711 59
Soldier Key	-	-	1	1,514 00	-	-	-	-	-	-	1	1,514 00
Marquis Key	-	-	1	5,500 00	-	-	-	-	-	-	1	5,500 00
French Reef	-	-	-	-	1	10,400 00	-	-	-	-	1	10,400 00
Croaker's Reef	-	-	-	-	1	7,933 00	-	-	-	-	1	7,933 00
Duck Key	-	-	-	-	1	1,120 00	-	-	-	-	1	1,120 00
Washerwoman	-	-	-	-	-	-	-	5,000 00	-	-	1	5,000 00
Ship Channel	-	-	-	-	-	-	-	-	1	9,600 00	1	9,600 00
Bahamas	-	-	-	-	-	-	-	-	1	200 00	1	200 00
Matacumbe	-	-	-	-	1	500 00	-	-	-	-	1	500 00
											117	613,847 40

APPENDIX No. 16.

Extract from the report of Lieutenant Commanding C. P. Patterson, U. S. N., assistant in the coast survey, to Professor A. D. Bache, Superintendent, on the hydrography of the head of Mobile bay, including a description of Dog river bar, and of Southwest and South Apalacha bars and of Blakely river bar.

Sheet No. 5.—Dog river bar and head of Mobile bay is included between the shores of the bay and the parallels of Dog River point station and that one mile north of Choctaw point light-house, including the four mouths of the Alabama delta, viz: 1. Mobile river, 2. Spanish river, 3. Apalacha river, 4. Blakely river; forming the same number of bars, viz: 1. Dog river bar, 2. Southwest Apalacha bar, 3. South Apalacha bar, 4. Blakely river bar; with their bay and river approaches.

1. *Dog river bar* is formed from the channel made by the rivers Spanish and Tensaw running into one 1⅓ mile above it, and is immediately at the SSW. end of the channel, the lower part of which has been dug out.

The depth of water upon this bar, at the plane of reference used, is 8.3 feet; giving 8.6 feet at mean low water, 5.8 feet at extreme low water, during continued northerly winds; 9.8 at mean high water, and 10.8 at extreme high water, during continued southerly and southeast winds. The bar being composed of soft sticky blue mud and clay, one foot more than the depth of water can be forced over.

The depth of water increases from the bar to the South Stake, (the SSW. end of the lower dug channel,) a distance of 370 meters, to 10 feet, which depth continues 200 meters NNE. of the Upper Stake, or NNE. end of the lower dug channel. At this point, where it meets the natural channel, there is a depth of 9.3 feet, and thence up through Choctaw pass, (the upper dug channel,) a depth of 10 feet can be taken into the mouth of Mobile river, where the depth is from three to five fathoms. At 1,150 meters NNE. of the Upper Stake, and opposite the Wreck Stake, where the channel, from the bar to Choctaw pass, changes its course from NNE. to N., the channel formed by the junction of the Spanish and Tensaw rivers is met by that from Mobile bay. Up this double channel the depth increases, from its junction to the limit of the soundings, from 12 to 27 feet.

The lower dug channel is the deepening of this channel over Dog river bar. The lower dug channel is 700 meters long upon a course of N. 2° 15′ E., with a width of 75 meters. The natural channel between it and Choctaw pass is 1,160 meters long, upon a course of N. 19° 30′ E. and 1,770 meters upon a course N. 19° 30′ E.; and the upper dug channel through Choctaw pass is 980 meters long, upon a course of N. 58° W., with a width of 30 meters.

2. *Southwest Apalacha bar* is formed by the southwest branch of the mouth of Apalacha river, is nearly in the middle of the head of the bay at its extreme northern end, and bears from Choctaw light-house S. 86° E., distant three miles. Over this bar there is a depth of 45 feet water, leading into a channel of 20 feet; which is again decreased to 13.5 feet in the main river.

3. *South Apalacha bar* is formed by the south branch of Apalacha river.

It is 1¾ mile S. 35° E. from Southwest Apalacha bar, and 4½ mile N. 80° E. from Dog river bar. Over this bar there is a depth of 4½ fee which gradually deepens to 13 feet in the main river.

4. *Blakely river bar* is upon the northeast side of the bay, tw and a half miles S. 40° E. from South Apalacha bar, and five and quarter miles S. 81° E. from Dog river bar, and is formed by Blakel river, the east branch of Apalacha river proper. Over this bar there is depth of five feet water, leading into a channel of twenty-two feet i the river. There being a channel of five and a half feet water betwee the east shore and this bar, it has been known as and called a Spi These three last bars are composed of hard sand mixed with a little blu clay or mud, and form a marked contrast to Dog river bar, which i composed of soft, sticky blue mud and clay.

From all the information to be obtained as to the depth of water at th head of the bay, I was led to believe that there might exist a deep chan nel into Blakely river on the northeast side, and that entensive flats, wit but six or seven feet water upon them, spread between Dog river bar an Blakely river bar. Neither of these are found to be so. The depth water gradually decreases from the general depth in the bay at the southern limit of the sheet, between the Tensaw and Apalacha rivers, du east of Choctaw Point light-house, and at the mouth of Choctaw bay.

Sheet No. 6.—Lower middle of Mobile bay is included between th parallels of Great Point Clear △ on the north, and that one-quarter of mile south of Point Juliet △; the shore on the coast and that on the ea between Point Clear and Mullet Point, and from the meridian of th latter until it meets the south parallel. Across this sheet, in the shi channel from the Lower bay, there is a gradually decreasing depth water of from fourteen and a quarter feet on the southern to twelve and quarter feet on the middle parallel, and increasing again to thirteen and quarter on the northern parallel. Near the northern edge of this shee between Great Point Clear and Fowl river, there are several lumps hard sand and shells, having from one-half to two feet less water upo them than around them.

APPENDIX No. 17.

Report by Lieutenant Commanding C. P. Patterson, United Stat navy, assistant in the coast survey, to the Superintendent, on beaco and buoys on Dog river bar and in Choctaw pass, head of Mobile bay.

UNITED STATES COAST SURVEY STEAMER "WALKER."

SIR: The following report respecting the locations, &c., of beacons f the channels over Dog river bar and through Choctaw pass, at the hea of Mobile bay, and through which all the trade of Mobile passes, is r spectfully submitted:

1. A beacon at the south end of Dog River Bar channel, in the pos tion of what is now called Lower Stake on the west edge of the channe with Choctaw light-house bearing north 7° west, distant 2.45 miles.

2. A beacon at the angle where the channel changes its directio from north 19° 30′ east to north, in the position of what is now calle

eck *Stake* on the west side of the channel, with Choctaw light-house ring north 24° 30′ west, distant 1.61 mile.

. A beacon at the angle where the direction of the channel changes n north to north 58° west into Choctaw pass, in the position of what ow called Tucker's Stake, on the west side, at the southeast end of octaw pass, with Choctaw light-house bearing north 64° west, dist 0.65 mile.

. A beacon on the side of the channel leading to the mouths of Span- and Tensaw rivers, in the position of what is now called Tucker's ke, with Choctaw light-house bearing north 63° west, distant 1.1 , and in a line with the range through Choctaw pass.

. A beacon on the east side of the same channel, in the position of t is now called Fowler's Stake, bearing from beacon 4 south 58° 30′ , distant 0.4 mile, so that beacon 4, on beacon 5, shall lead through octaw pass, and the channel leading to Spanish and Tensaw rivers be ween them.

hese beacons should all be substantially built and lighted. I would gest the light of beacon 1 to be red; that of beacon 2, white; beacon ed or green; beacon 4, white; and beacon 5 red, each beacon to be nted the color of its own light. As there is liability of vessels running and against the beacons, they should be protected by spring-fenders. uld these beacons be built, the light-house on Choctaw Point could discontinued; and the expense of keeping up the beacons would be the difference between their annual expense and that of the lightse.

rrangements could be made with the pilots of Dog river bar, for a ll compensation, to keep these lights up. At present the channels marked by wide stakes and small bushes, which, during the hazy ther of the business season, are constantly hid. The sameness of country gives no landmarks, and the narrowness of the channels ich are partly dug) renders it impossible to use them with ease, with- the assistance of these stakes, which should be superseded by proper- ghted beacons. The want of lights in these channels is the cause of t detention to the vessels used in taking merchandise to and from the s in the lower bay. The consequence is, expense incurred and much able time lost. I would respectfully call the attention of the depart- t to these beacons, that they may be erected at as early a date as ible.

ery respectfully, yours,

C. P. PATTERSON,
Lieutenant Commanding, and Assistant Coast Survey.

rofessor A. D. Bache,
Superintendent United States Coast Survey, Washington.

APPENDIX No. 18.

rt by Lieutenant Commanding C. P. Patterson, United States navy, sistant in the coast survey, to the Superintendent, on buoys and beacons the entrance to Mobile bay.

r: The following report upon the location, &c., for buoys and bea- for the entrance to Mobile bay, is respectfully submitted:

Buoys.

1. A buoy, or, far better, a boat-buoy, with a heavy bell, just outside the bar, in eight and three-quarters fathoms water, soft bottom, with Sand island light-house bearing north 22° west, and distant from the bar a mile. A buoy is necessary at this place at all times, but much more so during the thick, hazy, and foggy weather prevailing nearly through the most active season, when a bell would be of immense benefit.

2. A buoy off the south end of West bank, in twenty-five feet water, with Sand island light-house bearing south 11° 30′ west, distant 1.78 mile, on a range of Mobile light-house, on West Umbrella Tree.

3. A buoy off the north end of West bank, in forty-eight feet water, with buoy 2 bearing south 11° 30′ west, in range with Sand Island light-house, distant 1.68 mile, and Mobile light-house bearing south 55° 30′ east, distant 1 mile. The line joining buoys Nos. 2 and 3 will clear West bank.

4. A buoy off the southwest end of Middle Ground, in twenty-five feet water, with Mobile light-house bearing south 28° 30′ east, distant 1.66 mile.

5. A buoy on the northeast edge of West bank, opposite to the southwest end of the Middle Ground, with buoy 4 bearing north 72° east, distant 0.44 mile, and Mobile light-house bearing south 42° 30′ east, distant 1.82 mile. The line joining buoys Nos. 3 and 5 will clear the northeast edge of West bank.

6. A buoy on the twelve-feet spot (the northeast end) of the Middle Ground.

7. A buoy on the southwest point of the Spit, in nine feet water.

These buoys should be large; of such construction as to be seen some distance, of such form and so colored as to be known when seen in foggy weather, and to point out on which side they are to be passed. The system adopted for this purpose should be based upon the principles proposed by the late Lieutenant G. M. Bache, United States navy, in a report upon the buoys of Long island sound.

Beacons—Entrance to Mobile bay.

1. A beacon on Sand island, with the light-house bearing north 22° west, distant 245 feet. To cross the bar with beacon on the light-house

2. A beacon on Sand island, with the light-house bearing south 83° west, distant 145 feet; and beacon 1 bearing south 11° west, distant 250 feet; so that beacon 2, in range on beacon 1, shall clear the West bank.

3. A beacon on Revenue Point, the south end of East bank. This beacon would bear nearly the same relation to this entrance that the "Romet Beacon" bears to that of New York.

4. A beacon on Mobile Point, with the light-house bearing south 34° east, distant 140 feet, near the water, and on the range of the black barrel over the chimney of the frame house on middle of light-house; to lead through the channel between the southwest point of the Middle Ground and northeast edge of West bank.

5. A beacon on Mobile Point, with the light-house bearing north 46° 30′ east, distant —— feet; and beacon 4 bearing north 16° 30′ east, distant 240 feet; so that beacon 5, on beacon 4, shall clear East bank, and

con 5, on light-house, shall lead into the east end of Sand island nnel.

would propose that beacons 1 and 4 have red lights, and beacons 2 l 5 white lights. Flashing and fixed white lights would do better, are more expensive. It would not be *necessary* to light beacon 3, but rould be an advantage.

t would not be required to see these beacons more than 3½ miles; there- e, arcs of single reflectors (or better, the argand burner, with a single k) would be sufficient; and they need not be over 12 or 15 feet in ght, made strongly of rough wood.

eacons 2, 3, and 5 should be black; beacon 2, because it would show inst the sky, and to distinguish it from beacon 1, (as in red and te lights, flashes, &c.;) beacon 3, because it shows against the sky; con 5 because it shows against the sky, and to distinguish it from bea- 4. Red would probably be a better color than black.

eacon 1 should be black (or red) on the southeast side, as it would w against the white of Sand island light-house, and white on the h side, to distinguish it from beacon 2. Beacon 4 should be white, as ould show against the green glacis of the fort, and to distinguish it n beacon 5.

hese beacons could be erected and kept lighted at a small expense, no additional assistance would be required to the light-house keepers eep them up.

buoy on the northwest end of the northwest Pelican shoal, and a con on Dauphin island so placed that a bearing on it would be the rse into Pelican pass from outside, would be very useful to the mail mboats between New Orleans and Mobile during the winter months, n the north winds prevail, and the water is too low for them to use nt's pass, the inside route.

t present the marks for this entrance are very inferior: those for the st bank can scarcely be called such at all; and the mark leading through veen the Middle Grounds and northeast edge of West bank is of the est kind, small, and during hazy weather can scarcely be seen ex- with the sun to the westward. In foggy or thick weather, though wing themselves off the bar from the soundings and bottom, yet these not give their position with sufficient accuracy to allow the pilots to s the bar, which a bell-buoy would make them do with great ease. entrance to this bay, through which passes a yearly commerce of twenty ions, has no other marks or safeguards than the two light-houses, ch are very inferior to the third order of French light.

would therefore respectfully urge the great necessity of calling the y attention of the department to these buoys and beacons.

will merely state that during the past year $40,000 worth of property been lost on or near the bar, and $20,000 and upwards paid for sal- ; and this, in the opinion of all, for the want of good marks to clear dangers.

hese amounts I will forward as soon as they are obtained from the it of the underwriters at Mobile, who promised to forward them to me. amount of loss and salvage, however, is over $60,000.

Very respectfully, your obedient servant,

C. P. PATTERSON,
Lieut. Commanding, and Assistant Coast Survey.

rof. A. D. Bache, *Superintendent U. S. Coast Survey.*

APPENDIX No. 19.

Report of Lieutenant Commanding C. P. Patterson, United States navy, assistant coast survey, to the Superintendent, on buoys for Cat and Ship island harbors.

Coast Survey Office,
Washington, August 20, 1849.

Sir: The following report upon the locations, &c., of buoys for Cat and Ship island harbors is respectfully submitted:

1. A buoy just outside of Ship island bar, in 23 feet water, hard sandy bottom, with the west end of Ship island bearing north 53° east. To cross the bar in that course.

2. A buoy off the east end of Spade-fish shoal, (off North Spit of Cat island,) in 16 feet water, soft bottom, with Cat island light-house just on with north point of North Spit.

3. A buoy on the northeast edge of Cat island bar, in 18 feet water, with west end of Ship island, bearing north 66° east, distant six miles; south end of South Spit of Cat island bearing north 71° west, distant 2½ miles, and Sand Hill bearing north 5° west.

4. A buoy at the southeast end of Cat island channel, in 18 feet water, soft bottom, with south end of South Spit bearing north 11° 30′ west, distant 1½ mile; so that a course of south 71° west, distant 2⅕ miles between buoys 3 and 4, shall lead through the channel over the bar.

5. A buoy on the north side of Cat island channel, near the northwest end of the Mud-hole, in 18 feet water, hard bottom, with the south point of South Spit bearing north 73° east, distant 1⅓ mile, and Cat island light-house bearing north 36° west, distant 4 miles.

6. A buoy off Potato Hill, with Cat island light-house bearing north 5° west, distant 2½ miles. This buoy should be placed off the southwest point of Potato Hill, in 18 feet water.

7. A buoy off the east end of Pistol shoal, in 18 feet water, with Cat island light-house bearing north 24° west, distant 2⅔ miles, and the northwest point of Isle au Pied bearing south 42° east, distant 1⅔ mile.

8. A buoy off the north edge of Pistol shoal, in 16 feet water, with Cat island light-house bearing north 52° east, distant 3 miles; and buoy No. 7 bearing south 71° east, distant 1½ mile.

9. A buoy off the west end of Pistol shoal, in 18 feet water, with Ca island light-house bearing north 59° east, distant 4½ miles; and buoy No 8 bearing north 70° east, distant 1½ mile.

The want of landmarks makes the necessity of so great a number o buoys.

The increasing commerce of the coast will in time demand greater facilities to navigation, in several beacons and an increased number of buoys but the buoys named above are deemed sufficient for present purposes.

The importance of the channel south of Cat island, through which large portion of the smaller coasting trade to and from New Orleans mus pass, and of Ship island harbor as one of refuge, will be strongly felt a this trade increases, which it now is rapidly doing.

Very respectfully, yours,
C. P. PATTERSON,
Lieutenant Commanding, and Assistant Coast Survey.

Prof. A. D. Bache, *Superintendent Coast Survey.*

APPENDIX No. 20.

Description of a float for observations of surface currents, by Lieutenant C. P. Patterson, United States navy, assistant in the coast survey.—(See sketch H bis, current float.)

The current float consists of a pine top, sufficiently thick to give the requisite buoyancy, (see drawing,) and a keel of oak; the two are connected together by wire bolts, with heads and nuts passing through them, marked *b* in the drawing.

At the bow a flange marked *c* extends from the keel to the deck or upper piece, in the position and with the inclination shown in the drawing.

At the stern there is a flange marked *d*, having the position and inclination shown in the drawing, which likewise exhibits the connexion of the flange with the keel and deck.

On the deck, at the point marked *a*, there are grummets and thimbles by which the float is hoisted to davits; under the bow, at *e*, a staple receives the line.

Without the flange the float has a tendency to dive in a strong current, and has not sufficient resistance to draw the line tight in a weak current.

The flanges give resistance, with a tendency, increasing with the current, to depress the stern and raise the bow.

The only circumstances under which its action is defective is in a strong weather tide, with a fresh breeze, when the short sea under the stern flange tends to turn the float over.

CONTENTS OF THE APPENDIX.

1. Table showing the distribution of the parties of the coast survey in the several sections during the past year.
2. Results of the coast survey at different periods from 1807 to 1849.
3. Report of Lieutenant Commanding Charles H. McBlair, United States navy, assistant in the coast survey, to the superintendent, in relation to the discovery of four shoals in the main ship channel over the Nantucket shoals.
4. Letter of the Superintendent of the Coast Survey to the Secretary of the Treasury, on the detachment of Lieutenant Commanding Charles H. Davis, United States navy, from the work.
5. Report of Professor O. M. Mitchel, of Cincinnati, on the mechanical record of astronomical observations.
6. Report of Lieutenant Commanding Charles H. Davis, United States navy, assistant in the coast survey, to the superintendent, on the determination of the position of Cashe's ledge, off the coast of New England.
7. Letter from the hydrographer to the Admiralty Board to the Superintendent of the Coast Survy, in relation Cashe's ledge.
8. Report of Lieutenant Commanding J. R. Goldsborough, United States navy, assistant coast survey, of the circumstances of the rescue of three persons from a vessel capsized in a squall of wind, October 24, in the Vineyard sound.

9. Letter from Elam Alexander, esq., president of the Washington and New Orleans telegraph line, giving free use to the coast survey of the telegraph line for astronomical purposes, with the reply of S. C. Walker, esq., assistant United States coast survey.

10. Tables showing cost of steamer Legaré in 1848 and 1849.

11. Extract from a letter to Professor A. D. Bache from W. M. Boyce, esq., assistant United States coast survey, dated January 31, 1849.

12. Letter of J. W. Page, Merry Hill, Bertie county, North Carolina, to the superintendent United States coast survey, relating to a memorandum found in a bottle on the coast of North Carolina, thrown from the coast survey steamer Jefferson.

13. Report of Lieutenant Commanding J. N. Maffitt, United States navy, assistant in the coast survey, to the superintendent, in relation to a light-house at Bull's bay, on the coast of South Carolina.

14. Extract from the annual registers of marine disasters on the Florida reef, (received from Assistant F. H. Gerdes, United States coast survey.)

15. Tabular statement of the losses and damages that occurred in the years 1844 and 1848 at the Florida reef, designating the different localities and damages on each, by F. H. Gerdes, assistant United States coast survey.

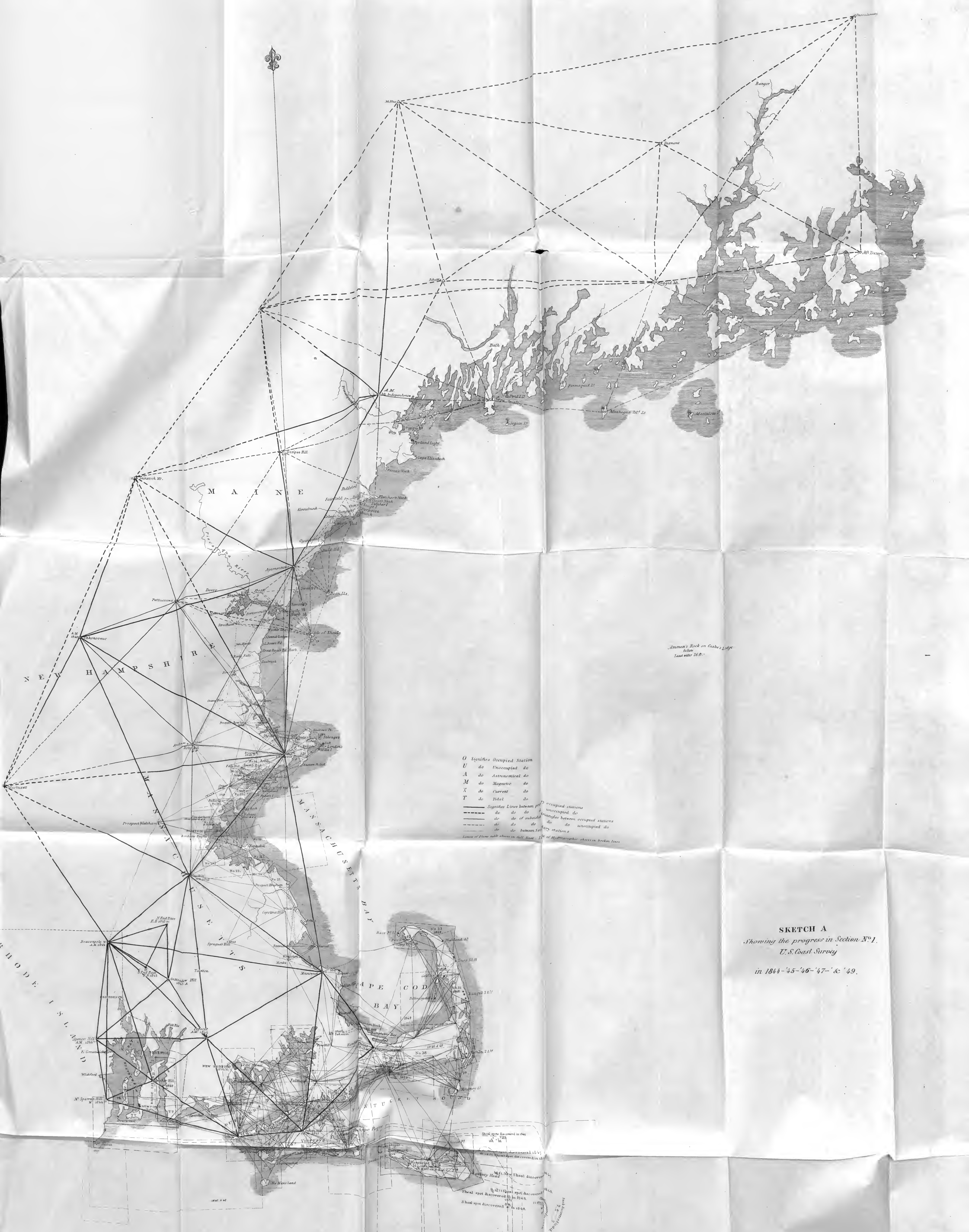
16. Extract from the report of Lieutenant Commanding C. P. Patterson, United States navy, assistant in the coast survey, to Professor A. D. Bache, superintendent, on the hydrography of the head of Mobile bay, including a description of Dog river bar, and of Southwest and South Apalacha bars, and of Blakely river bar.

17. Report of Lieutenant Commanding C. P. Patterson, United States navy, assistant in the coast survey, to the superintendent, on beacons and buoys on Dog river bar and Choctaw pass, head of Mobile bay.

18. Report of Lieutenant Commanding C. P. Patterson, United States navy, assistant in the coast survey, to the superintendent, on buoys and beacons at the entrance to Mobile bay.

19. Report of Lieutenant Commanding C. P. Patterson, United States navy, assistant coast survey, to the superintendent, on buoys for Cat and Ship Island harbors.

20. Description of a float for observations of surface currents, by Lieutenant C. P. Patterson, United States navy, assistant in the coast survey. (See sketch H *bis.*)

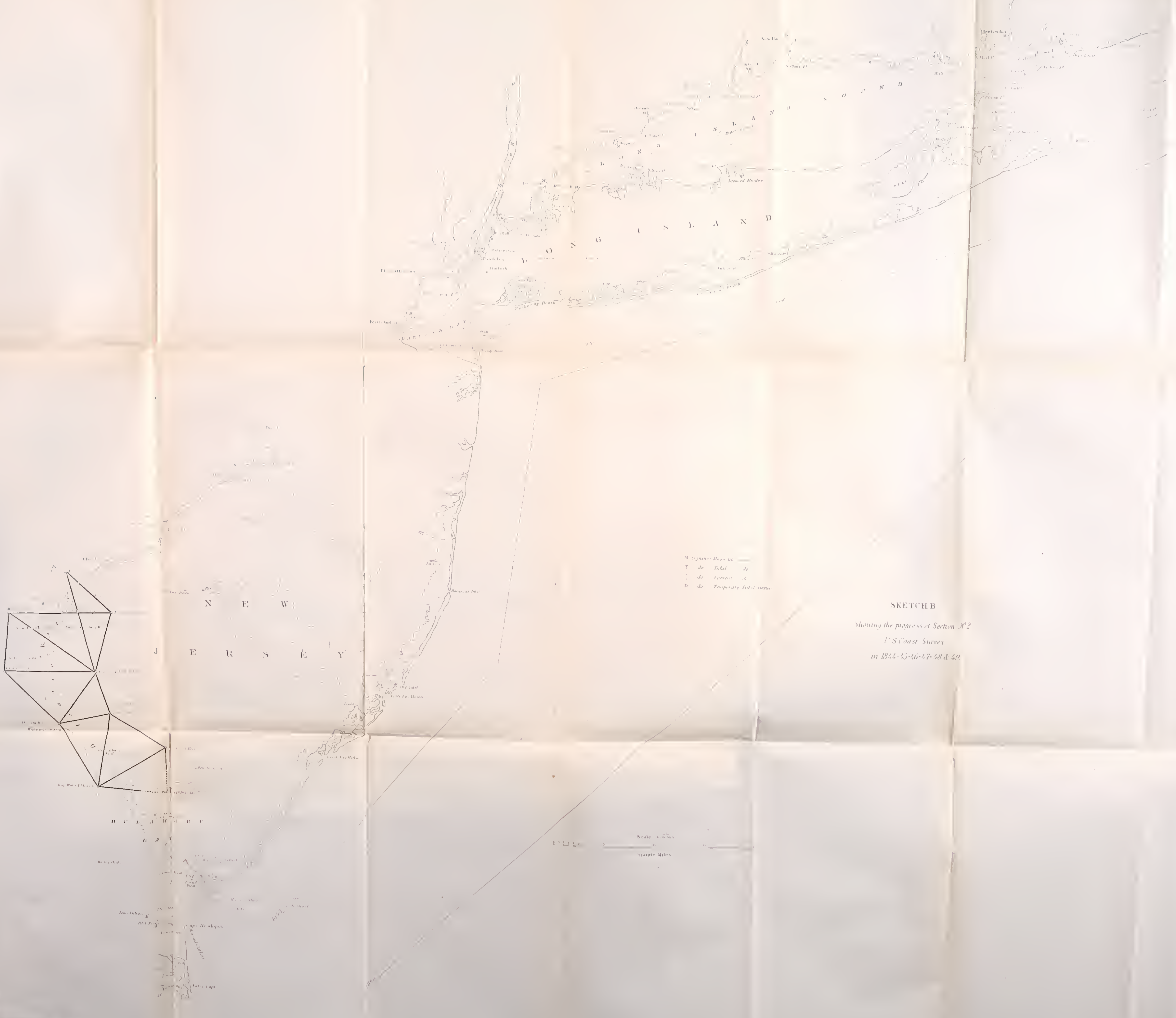


SKETCH A

Showing the progress in Section No. 1.

U.S. Coast Survey

in 1844-'45-'46-'47-' & '49.

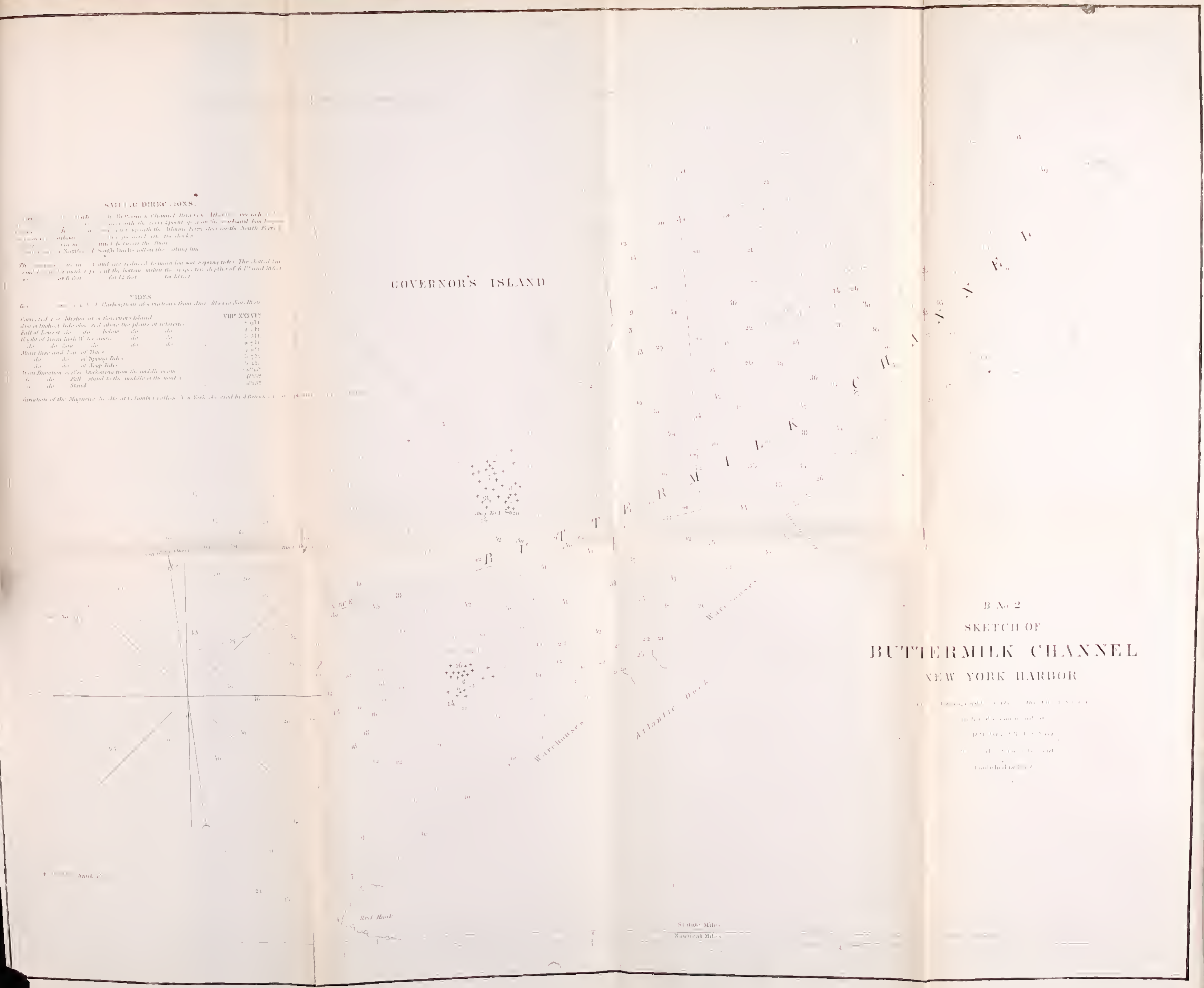


SKETCH B

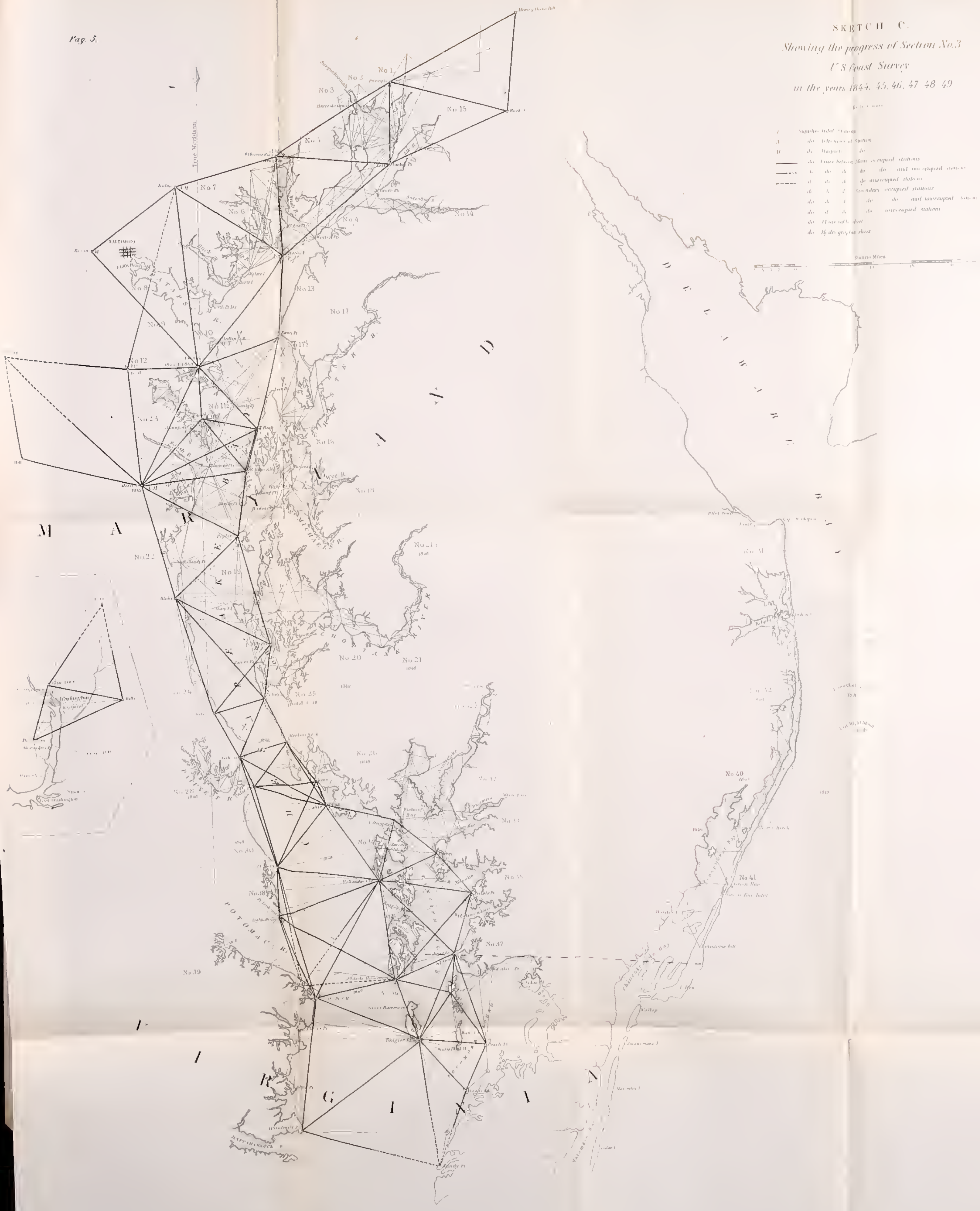
Showing the progress of Section No. 2

U.S. Coast Survey

in 1844-45-46-47-48 & 49.


B No 2
SKETCH OF
BUTTERMILK CHANNEL
NEW YORK HARBOR
GOVERNOR'S ISLAND
BUTTERMILK CHANNEL
Warehouses
Atlantic Dock
Red Hook
Statute Miles
Nautical Miles
SAILING DIRECTIONS.
TIDES
VIII XXXVI
Fall of Lowest do do below do do
Mean Rise and Fall of Tides
do do of Spring Tides
do do of Neap Tides
do do Fall
do do Stand

Pag. 5.



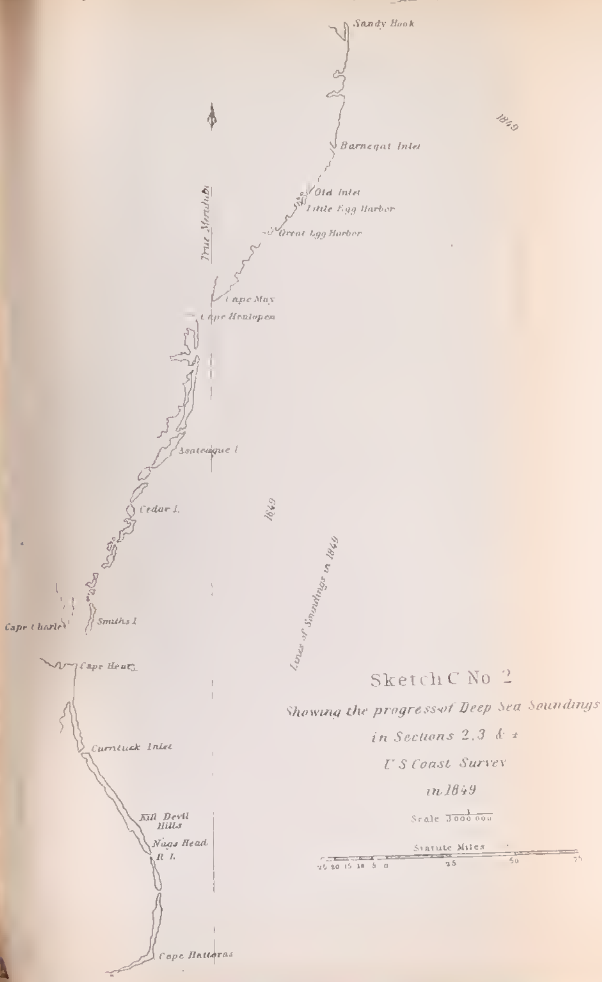
SKETCH C.

Showing the progress of Section No. 3

U. S. Coast Survey

in the years 1844, 45, 46, 47, 48, 49

Pag. 6.



Sketch C No 2

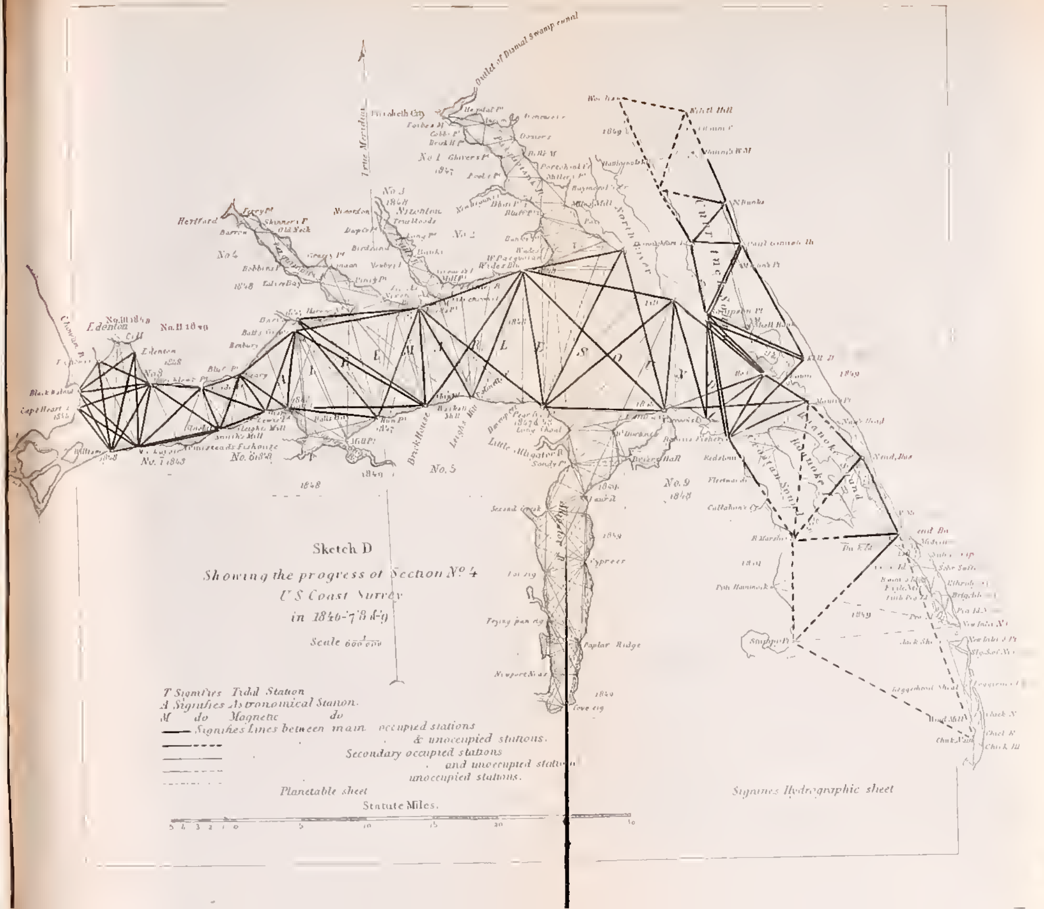
Showing the progress of Deep Sea Soundings

in Sections 2.3 & 4

U S Coast Survey

in 1849

Scale $\frac{1}{1000\,000}$



Sketch D

Showing the progress of Section No. 4
U S Coast Survey
in 1846-'7'8 &-'9

Scale $\frac{1}{600\,000}$

SKETCH D No.3
of
CAPE HATTERAS
and Cove for Anchorage

by the Hydrographic party of the Coast Survey
under the command of Lieut. J N Maffit U.S.Navy
A.D Bache Superintendent
June 1st 1849
Scale 30 600

Sailing Directions

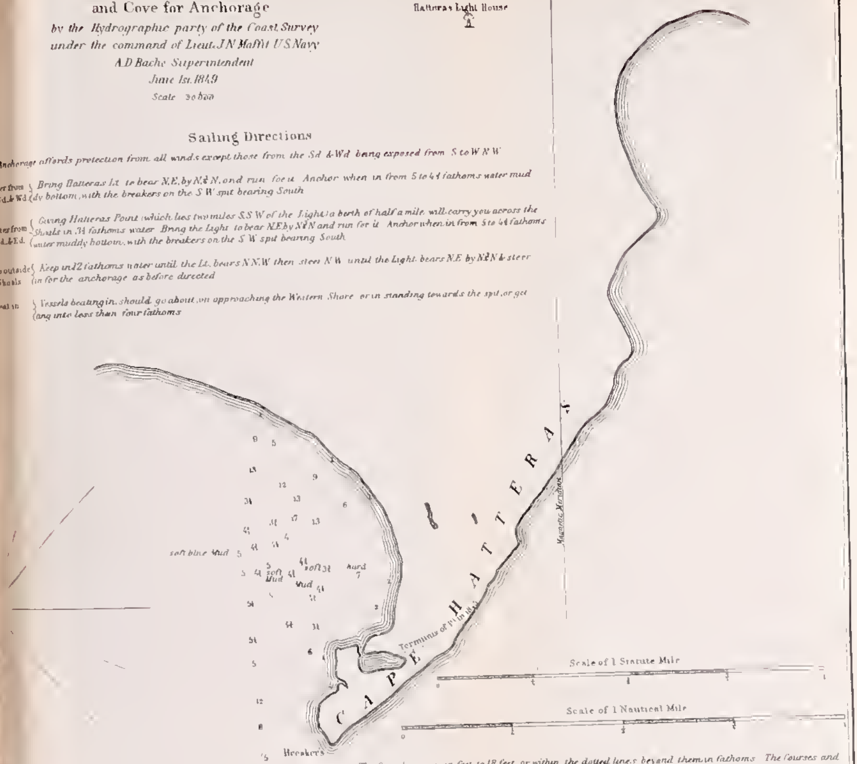
his Anchorage affords protection from all winds except those from the Sd & Wd being exposed from S to W N W

enter from the Sd & Wd { *Bring Hatteras Lt to bear N.E. by N¾ N. and run for it. Anchor when in from 5 to 4½ fathoms water muddy bottom, with the breakers on the S W spit bearing South*

enter from the Nd & Ed. { *Giving Hatteras Point (which lies two miles S.S W of the Light) a berth of half a mile will carry you across the Shoals in 3½ fathoms water. Bring the Light to bear N.E by N¾ N and run for it. Anchor when in from 5 to 4½ fathoms water muddy bottom, with the breakers on the S W spit bearing South*

go outside the Shoals { *Keep in 12 fathoms water until the Lt. bears N.N.W then steer N W until the Light bears N.E by N¾ N & steer in for the anchorage as before directed*

To beat in { *Vessels beating in, should go about on approaching the Western Shore or in standing towards the spit, or getting into less than four fathoms*



The Soundings are in feet to 18 feet, or within the dotted lines beyond them in fathoms. The Courses and Bearings are Magnetic and the Distances in Nautical miles. The dotted lines beyond low water mark represent the bottom within the respective depths of 6, 12 and 18 feet. thus for 6 feet for 12 feet, and for 18 feet

SKETCH D No 4

U.S. Coast Survey A.D. Bache Superintendent

HATTERAS INLET

(Harbor of Refuge)

Coast of North Carolina

Reconnoissance by the party under the command

of Lieut J. Alden U.S. Navy

Assistant in the Coast Survey

June 1849

Scale 1/20000

SAILING DIRECTIONS

Hatteras Inlet bears S 70° W W by S ¾ S 12 miles distant from Cape Hatteras L.H. It is easily known by a remarkable round hammock covered with trees on the East side of the entrance.

The breakers seldom extend entirely across the entrance but at nearly all times make on each side and between them lies the Channel.

The bar should be approached from the Northward and Eastward keeping from 5 to 6 fathoms water along the breakers until up with the opening. The course in is N W by W ¾ of a mile keeping the Eastern breakers aboard until the house on the East Point of the entrance is on with the south edge of the trees on the hammock, when the course is N W ½ W ¾ of a mile bringing the house on the East Point just open to the Nd of the trees on the hammock then the course is N W by N ½ N ¾ of a mile to the anchorage just inside of the sand spits which are bare at low water and show at all times distinctly.

The best anchorage for vessels drawing not over 10 feet is marked on the Sketch.

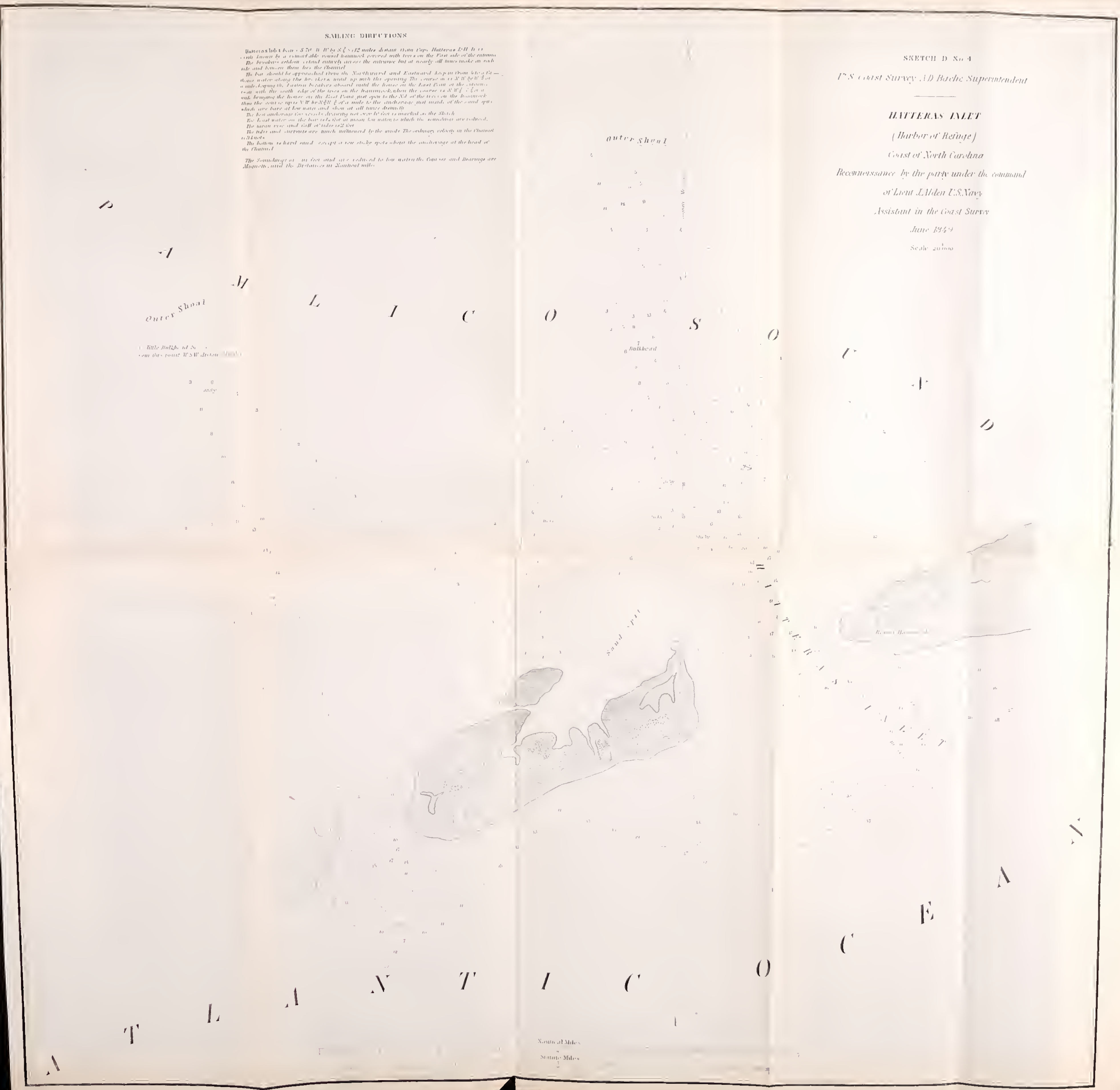
The least water on the bar is 8 feet at mean low water to which the soundings are reduced.

The mean rise and fall of tides is 2 feet.

The tides and currents are much influenced by the winds. The ordinary velocity in the Channel is 3 knots.

The bottom is hard sand except a few sticky spots about the anchorage at the head of the Channel.

The Soundings are in feet and are reduced to low water. The Courses and Bearings are Magnetic and the Distances in Nautical miles.

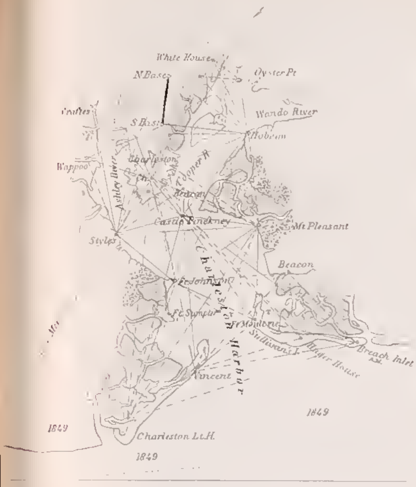


Sketch E bis

Showing work in Charleston Harbor

1849

Scale $\frac{1}{[illegible]}$



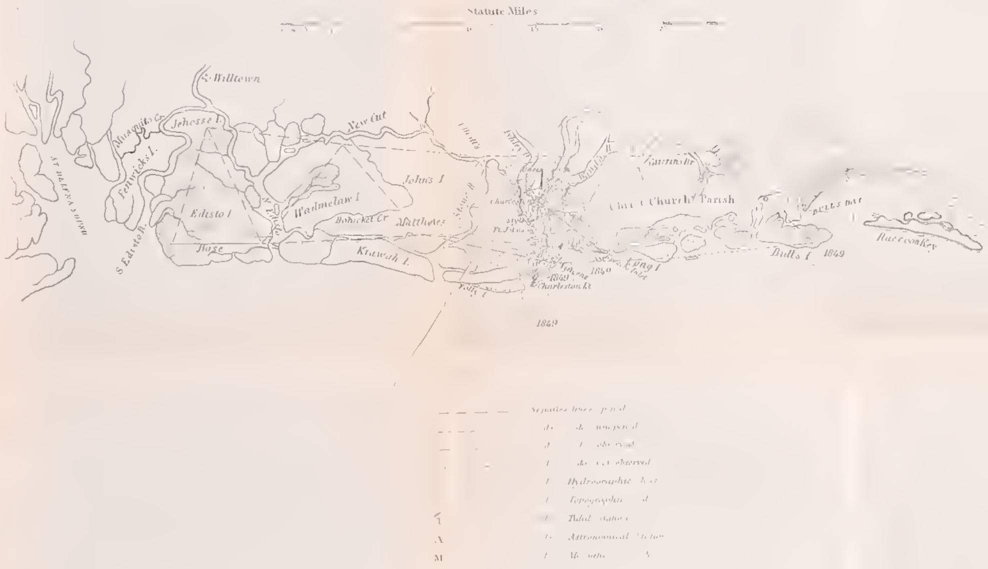
Sketch E

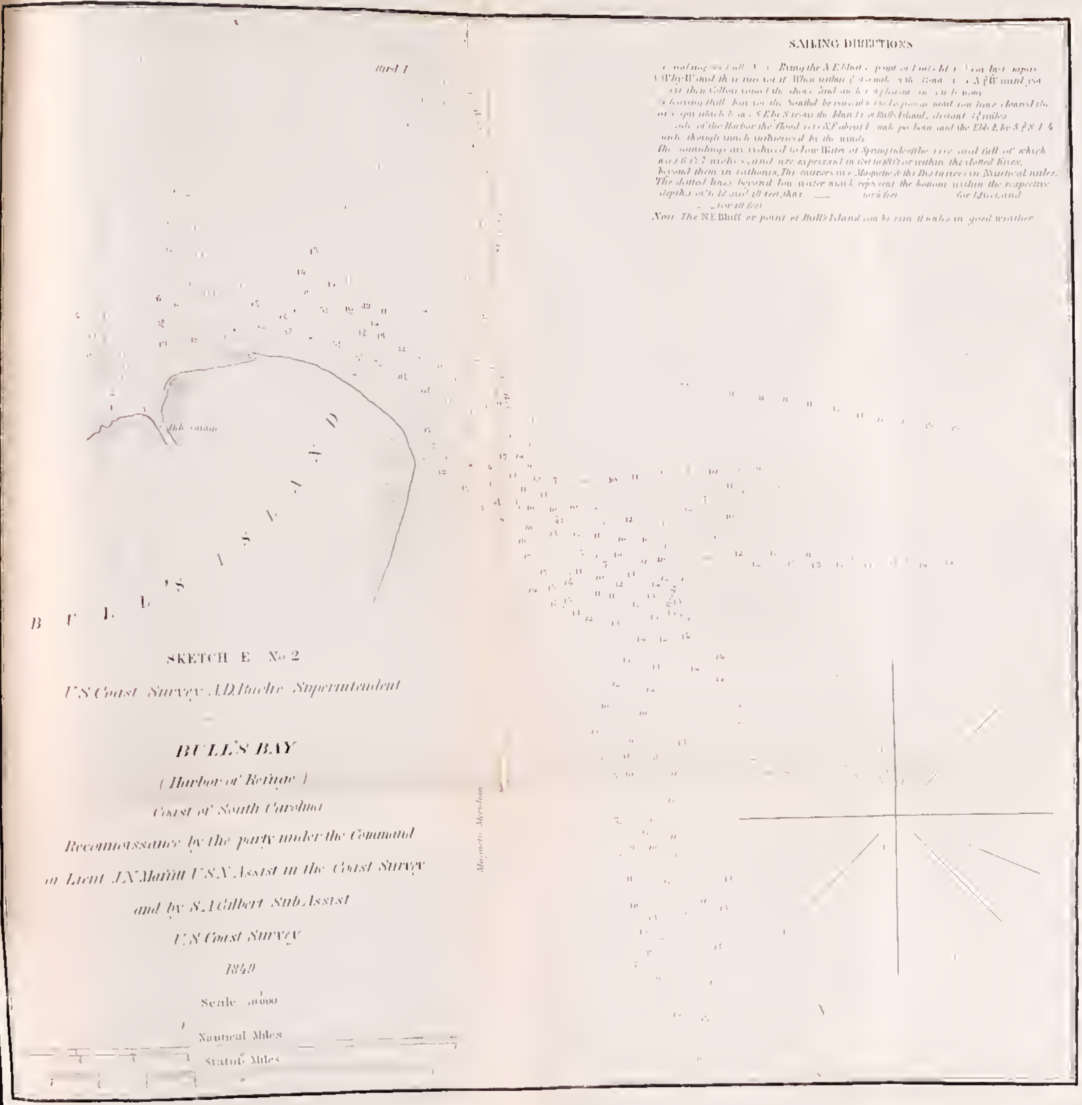
Showing the progress of Section No [illegible]

U S Coast Survey

1847 – '48 – '49

Scale $\frac{1}{[illegible]}$





SAILING DIRECTIONS

[illegible] Bring the N.E. Bluff or point of Bull's Island [illegible] upon N.W. by W. and then run for it. When within [illegible] miles of the Island [illegible] N.¾W. until [illegible] then follow round the shore and anchor [illegible]

[illegible] leaving Bull's bar on the Southd. be careful [illegible] until you have cleared the [illegible] which bears S.E. by S. from the Mansion at Bull's Island, distant 1½ miles.

[illegible] of the Harbor the flood sets N.E. about [illegible] miles per hour and the Ebb E. by S. ½ S. 1 ¼ miles though much influenced by the winds.

The soundings are reduced to low Water of Spring tides (the rise and fall of which was 6 ft. 7 inches) and are expressed in feet to 18 ft. or within the dotted lines, beyond them in fathoms. The courses are Magnetic & the Distances in Nautical miles. The dotted lines beyond low water mark represent the bottom within the respective depths of 6, 12 and 18 feet, thus ___ for 6 feet ___ for 12 feet, and ___ for 18 feet.

Note The N.E. Bluff or point of Bull's Island can be seen 11 miles in good weather

SKETCH E No. 2

U.S. Coast Survey A.D. Bache Superintendent

BULL'S BAY

(Harbor of Refuge)

Coast of South Carolina

Reconnoissance by the party under the Command of Lieut. J.N. Maffitt U.S.N. Assist. in the Coast Survey and by S.A. Gilbert Sub. Assist.

U.S. Coast Survey

1849

Scale 1/40000

SKETCH F

Showing the progress of Section No. VI

U.S. Coast Survey

in 1849

Reconnaissance of Florida Keys, Biscayne Bay & Card's Sound

Scale $\frac{1}{600\,000}$

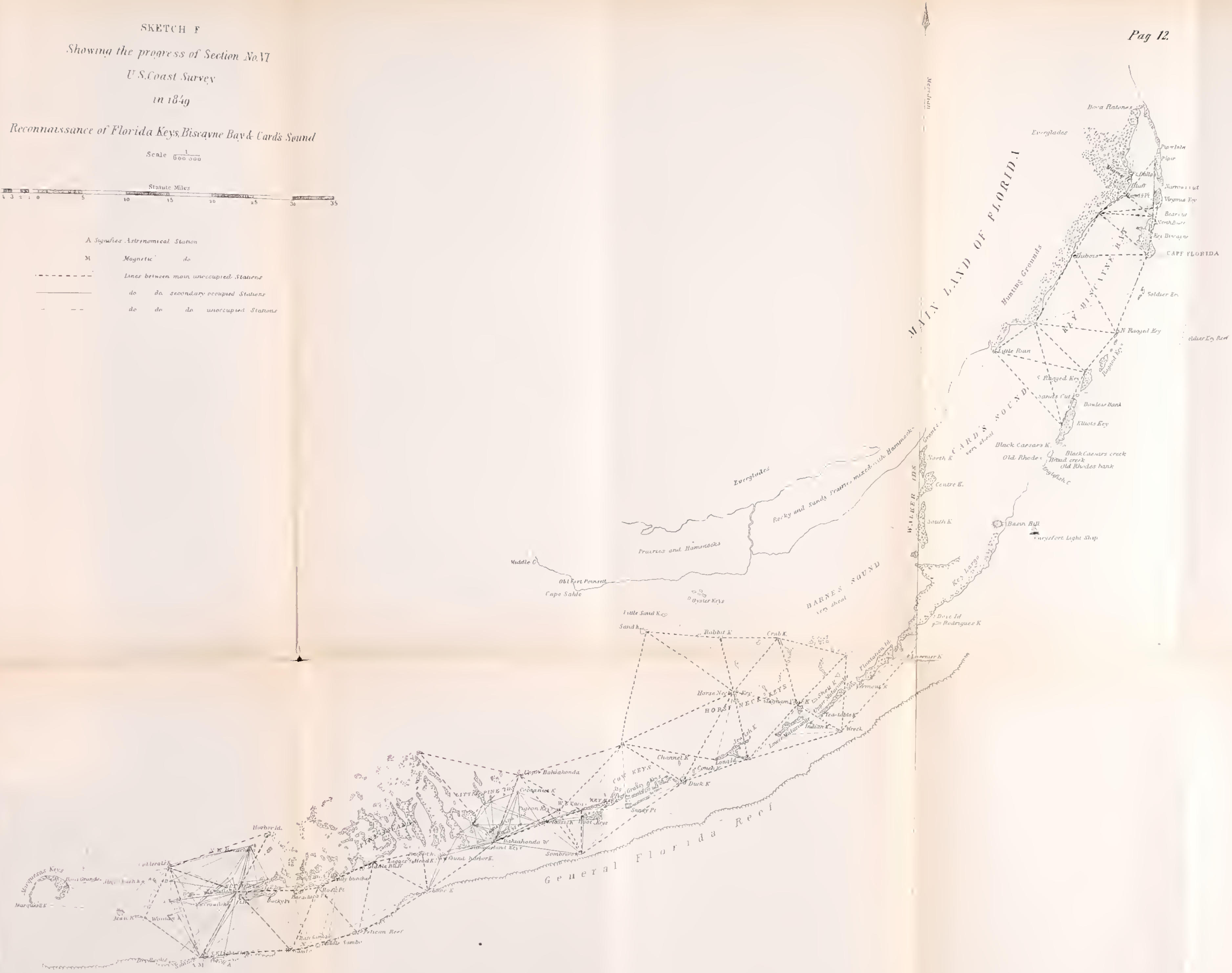
A *Signifies Astronomical Station*

M *Magnetic do*

- - - - - - - *Lines between main unoccupied Stations*

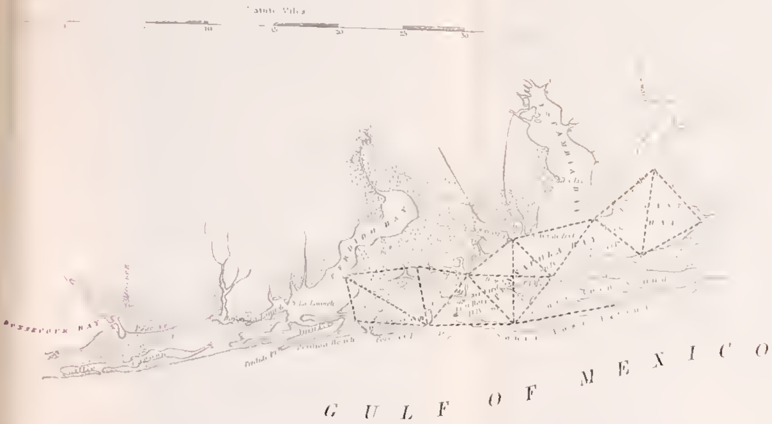
——— *do do secondary occupied Stations*

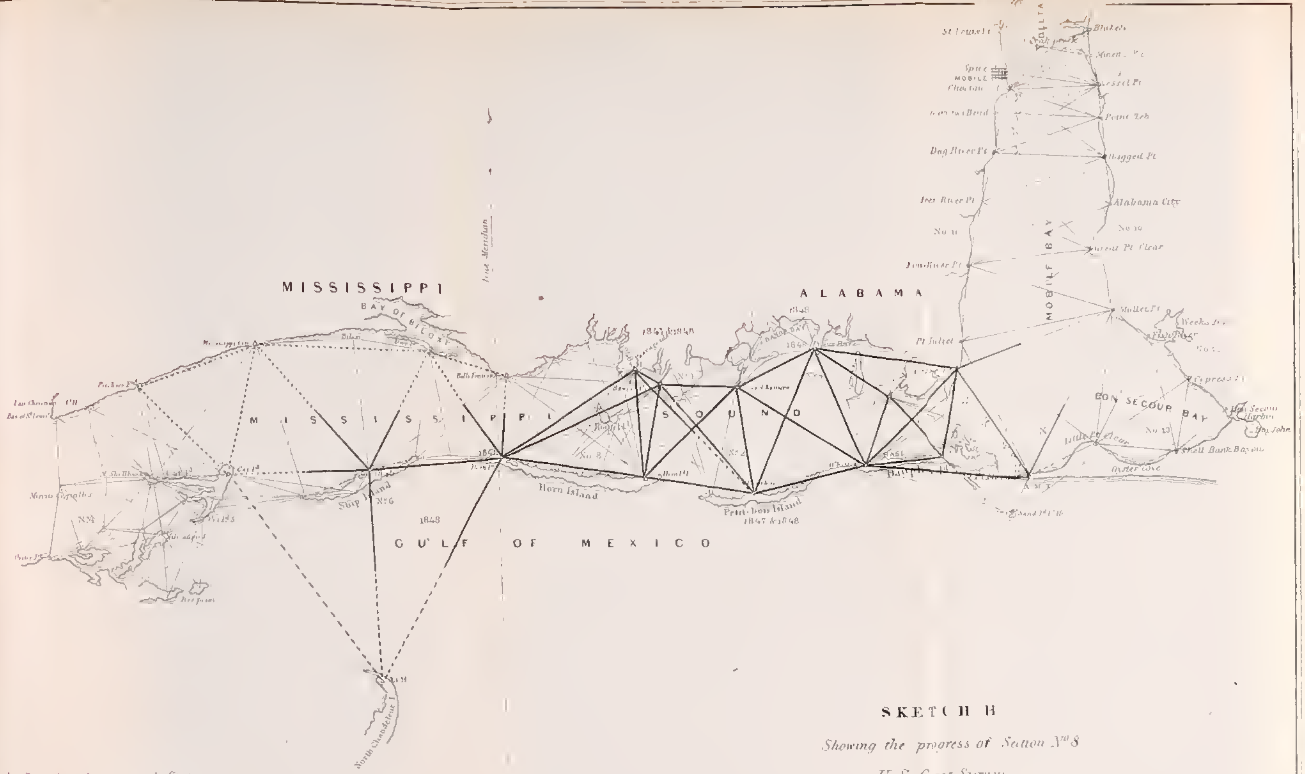
– – – *do do do unoccupied Stations*



SKETCH G

Showing the progress in Section No. 7
U.S. Coast Survey
in the year 1849
Reconnoissance of Pensacola and Perdido Bays
and plan of Triangulation





SKETCH H

Showing the progress of Section No 8

U. S. Coast Survey

in 1846-7-8 & 9

Scale $\frac{1}{600,000}$

Statute Miles.

A *Signifies Astronomical Station*
M „ *Magnetic Station.*
X „ *Current Station*
T „ *Tidal Station.*

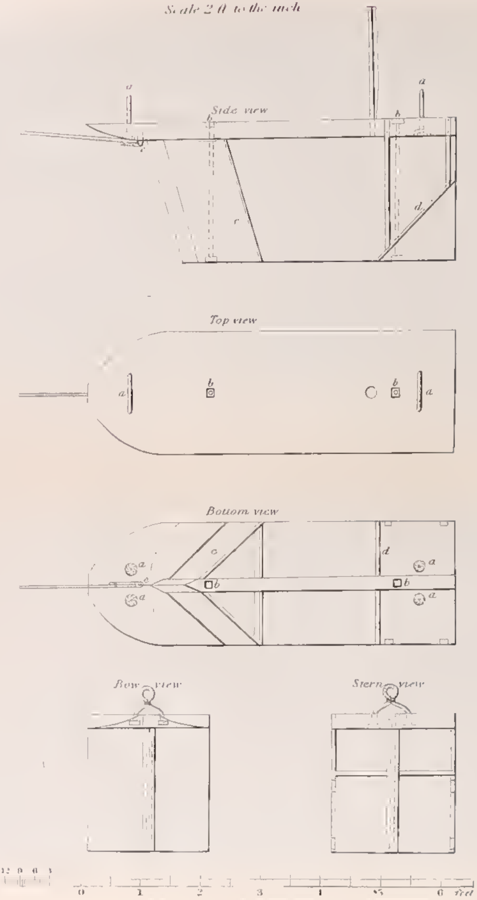
—— *Lines between primary occupied stations*
——----- *do do occupied & unoccupied stations*

------------ *Lines between primary unoccupied stations*
—— *do do secondary occupied „ „*
Topographical Sheets
Hydrographical „

Sketch H bis

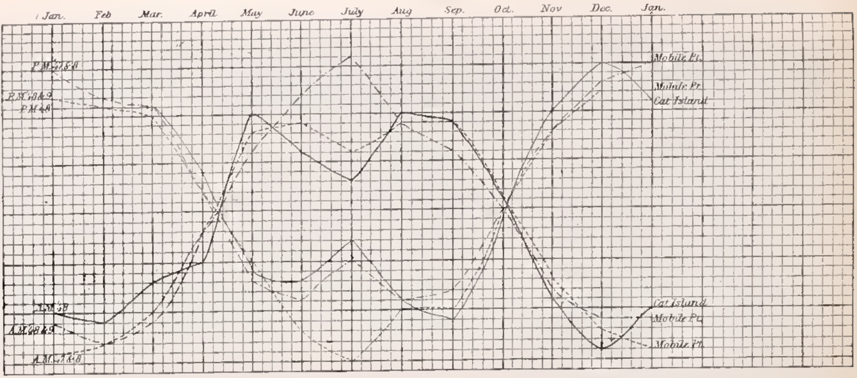
PATTERSON'S CURRENT FLOAT

Scale 2 ft. to the inch

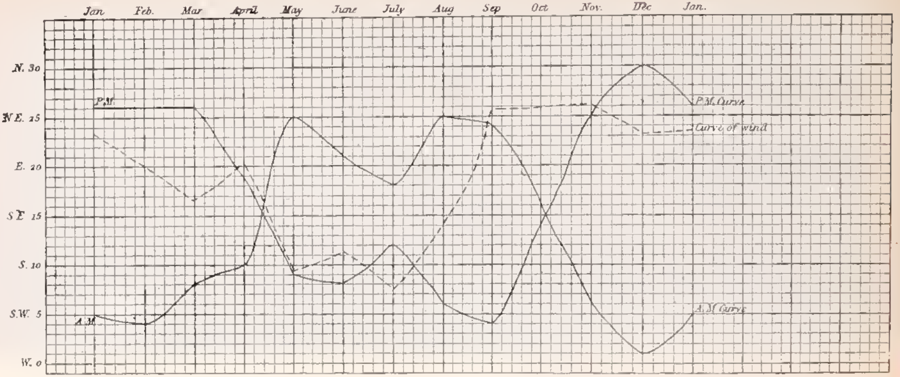


Sketch H *(tris)*

Curves showing the number of times of High Water in the A.M. & P.M. hours for each month of the years from June 1847 to June 1848 at Mobile Point, and 1848 at Cat Island.



Curves showing the number of times of High Water in the A.M. & P.M. hours for each month of 1848 at Cat Island Mississippi Sound, and the curve of prevailing winds for the same.



Showing the progress in Section No 9
U S Coast Survey
in 1848 & 49

Scale $\frac{1}{600000}$